The Chemical Age

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Notes and Comments

Chemistry House

ONCE again the foreigner has been quicker to move than the Englishman. The French are to be congratulated upon the inauguration of the Maison de la Chimie described in our issue of December 8—a veritable Castle of Chemistry. The sister project broached a few years ago for this country is also a castle—in Spain! A difference in mentality is to be seen in the fact that in spite of economic depressions the French Government has assisted in the building of this house, so typical of the scientific age in which we live. Why should there be a "Chemistry House"? Surely one reason sufficient unto itself is the personal contact that would be brought about between workers in all branches. It would hardly be thinkable that Chemistry House did not sink the differences between the several chemical and near-chemical societies merging them into one in which the experience gained in one branch of investigation or technique would become more readily available for all. The unification of societies must also be closely linked with the idea of a central building to house all chemical institutions and all chemists, professionally and socially.

Science in most branches is to-day burdened by a dead weight of brushwood that never was really alive. Professor Armstrong hit the nail on the head when he advised the sponsors of the Maison de la Chimie to work for the reduction of the mass of worthless publication. A national chemical journal should print only papers of genuine significance, well written and readable, but avoiding the mass of scientifically-phrased rubbish which to-day so "clutters-up" our transactions as to make real advances difficult to find. "The great task before us to-day," says Professor Armstrong, "is to produce great men." Chemistry House would assist that object. The provision of a focus and a rallying point for all chemists, a place wherein the Institute lion could lie down in peace with the B.A.C. lamb, where the academic chemist and the industrial chemist could compare notes, where the manifold staffs now carried by scientific societies could be reduced to one staff with one subscription—that in itself seems something worth working hard to attain.

Trade Policy for the Empire

SIR WILLIAM ALEXANDER urged the setting up of a general trade policy for Great Britain and the Empire in his presidential address at the annual meeting of the National Union of Manufacturers held in London last week. The Union is not a political body and it does not hesitate to criticise the Government when it believes its policy to be mistaken, but it acknowledges that the present Government, by balancing its Budget and converting the debt and by initiating the system of Empire trade has created a measure of confidence which has enabled the country to regain some of its trade. The trade agreements, however, show, in Sir William's opinion, that the Government has no thought-out plan for developing and using the new system in order to promote international trade. Apart from Empire trade the only idea seems to be to make hand-to-mouth bargains with foreign countries to secure temporary advantages without any settled plan and without counting the cost. Foreign countries, so far as the Union can judge, seem to be in much the same position, all striving desperately to get some short term advantage for themselves. The only country that appears to have any thought-out trade policy is Japan, and in that case it looks as if a trade plan of campaign had been worked out by the Government in concert with the leaders of Japanese industry.

There is no good reason why this country, and the Commonwealth of which it is the centre, should not have a trade policy every bit as effective as that of the Japanese if it were, as appears to be the case with theirs, based on a careful survey of the ground and on a real understanding between Government and industry. The resources of the British Commonwealth, material and moral, are at least as great as those of any other unit in the world and there can be no question as to the ability and readiness of the members of the Commonwealth to act together for an object which appeals to their interest and their imagination. The vision of the Empire acting as a trade unit is one which appeals at once to the imagination and on the interest side it is obvious that the Empire acting as a unit would be able to make far better trading arrangements with Japan and the United States, and make far better arrangements for the shipping on which we all depend, than any one constituent member could effect by itself. The Empire acting as a whole in accordance with a settled plan would be far more able to deal satisfactorily with such matters as Japanese competition or subsidies or dumping or any other form of attack on our home market than this country could by acting alone and without a plan. There is in addition the general point to which Sir William Alexander referred, that the economic front is far more important than either the military or the political, and, if we can do anything in the direction of lessening the present feeling of unsettlement and uneasiness in all commercial

relations and in the direction of facilitating and stabilising the exchange of goods and services between nations, we shall be doing our duty not only as manufacturers but as citizens.

By-Product Coking

BY-PRODUCT coking has definitely entered the ranks of chemical industry. Its past history is unlike that of any other of the activities of the chemist. It grew, under the fostering care of the colliery owner—the most unlikely father of a chemist—from the non-chemical beehive coke-ovens. The colliery surface foreman was the first coke-oven manager—it is likewise impossible to imagine anyone with less of the practice and mentality of the chemist than the old-time colliery foreman. The constructors set up laboratories and undertook development work; from that work sprang much that was scientific and advanced.

The coke-oven by-product plant—a more chemical affair than the gasworks purification installation—came into being and the works chemist began to assume importance. Personnel was to some extent supplied from the staffs of the constructional firms, but only a fraction could come from that source and the remainder had to be secured elsewhere, for the most part by long and careful training of youths without university experience, on the works. The fact that over 93 per cent. of the members of the Coke Oven Managers' Association do not hold university degrees and yet have brought their industry to so high a pitch of perfection is something of which the country may well be proud.

Overworking the Plant

IN his recent presidential address to the Coke Oven Managers' Association, Mr. G. J. Greenfield raised a point of interest to the whole chemical industry: to what extent should a plant be worked above rated capacity when to do so will result in shortening its useful life? A principle that was apparently introduced in America was to work every plant to its highest capacity and to scrap ruthlessly upon the smallest provocation, the idea being apparently a short life and a gay one. On the other hand it must be remembered that to-day most plants do not operate at such high pressures because the market for the product simply it not there. A plant is put down upon certain financial figures which take into account not infrequently quite a lengthy period of depreciation.

When the market improves, the tendency is to take advantage of the conditions to get the maximum output from the installation regardless of the probable effect upon the useful working life. The works manager is not alone to blame because his sales manager and his managing director not infrequently applaud his efforts to increase the output. If that can be done by means which do not increase the wear and tear out of proportion to the output, there is no harm done. Not only may the plant be seriously affected detrimentally by pushing it too hard, however, but the actual result, whether in terms of utlimate products or of purity, may be different from what is expected. As Mr. Greenfield asked his own Association: " First, is it possible to overload the coke-ovens to the point of diminishing the yields of by-products per ton of coal or of reducing the quality of the coke? Second, is it not possible to reach a point where the more rapid usage of machinery results in wear and tear much greater than is proportional to the rate of usage? " These questions in an appropriate form may be asked of most branches of chemical industry.

New Industries Avoid Smoke

NEW industries when seeking sites for development, fight shy of smoky, grimy areas, knowing that their products may suffer damage and that their overheads will certainly be considerably increased. Mr. Arnold Marsh, secretary of the National Smoke Abatement Society, stressed this point in addressing a meeting of representatives of the local authorities in the area of the Northumberland and Durham Regional Smoke Abatement Committee, at Newcastle-on-Tyne last week. People on the North-East coast, confusing cause and effect, have sometimes expressed the wish to see more smoke, thinking that it indicates industrial activity. Industrial activity, however, is better measured by employment and production; smoke indicates a gross inefficiency and wastage of fuel.

The coming development of internal air routes and the consequent establishment of new airports, is creating eagerness among local authorities seeking to ensure their future prosperity. For a modern airport an unpolluted atmosphere is as essential as deep water is for a seaport. Smoke-shrouded towns cannot be relied upon to give sufficient visibility for safe landing, and have a greater number of days each year when flying is impossible. Such towns will, therefore, be avoided in preference to those with cleaner air when the new air routes are being planned. Because of this, and because of the value of attracting new industry, local authorities in promoting smoke abatement are insuring for their future prosperity.

Speedy Laboratory Methods

IT is not infrequently that the works laboratory is blamed for holding up an urgent analysis, but it is frequently true that the blame has been wrongly placed. It is the works executives who are at fault for their lack of attention to modern needs, in not providing the laboratory with equipment which allows the analyst to speed up his work by recognised and legitimate methods. In many directions the use of optical instruments will effelt a notable saving in time, in comparison with wet methods of analysis—where it may be necessary to " boil slowly for 15 minutes," " allow to stand undisturbed for 10 minutes," " filter, ignite and cool in a desiccator." Even official methods of analysis with their outstanding conservatism, are now adopting the use of optical instruments to a notable extent—spectrograph, comparator, refractometer and colorimeter. The quartz spectrograph records all wavelengths which are useful for chemical analysis, and the observations are made by photography so that they become permanent records which are capable of showing a complete qualitative analysis; in some cases a surprisingly accurate quantitative analysis is also possible. Optical instruments are not unduly expensive when it is taken into consideration that they will last 10 or 20 years, and that during the whole of this period they are effecting a notable saving in time combined with a great and constant accuracy in analytical results.

The Production of Organic Acids by Fermentation—I

A Survey of Processes Applied to Carbohydrates in Particular

IT is within the last thirty years that biochemical processes have been definitely applied on a commercial scale to the production of organic acids. In one direction we have seen the development of an industry where acetic acid is produced from alcohol by *Mycoderma aceti;* in another direction, the production of lactic acid by the action of *Bacterium lactis acidi* on molasses; and in a third direction, the production of citric acid by *Aspergillus niger* when grown in sucrose solutions. These are only three examples of this type of reaction, but in the study of similar fermentations, particularly applied to carbohydrates, the Bureau of Chemistry and Soils, United States Department of Agriculture, did very useful work in 1932 by publishing abstracts of patents and papers (Circular No. 216), whilst fermentation processes generally have been exhaustively dealt with in monographs on the production of ethyl alcohol, acetone and butyl alcohol.

Acetic Acid

It was less than 100 years ago that Kützing ("Journ. Prakt. Chem.," 1837, *11,* 385) first definitely demonstrated that acetic acid was formed by the oxidising action of certain micro-organisms on alcohol. It is now known to be a substantial part of the final products of butyric, lactic and propionic fermentations, and is always present in varying quantities in alcoholic fermentations induced by bacteria.

Notwithstanding the great progress made in the manufacture of anhydrous acetic acid by synthetic methods, considerable work has been done with a view to utilising the activity of certain organisms in transforming cellulosic materials into acetic acid and ethanol. Langwell (Brit. Pat. 248,795 and U.S. Pat. 1,602,306) has developed processes in which crude manure cultures of thermophillic bacteria attack waste cellulose, forming acetic and butyric acids and ethanol. Viljoen, Fred and Peterson ("Journ. Agric. Sci.," 1926, *16,* 1) have isolated cultures of thermophillic bacteria which destroy cellulose at 65° C., forming acetic acid. The quantity of cellulose destroyed in 1 to 5 per cent. suspensions ranged from 70 to 95 per cent., 50 to 55 per cent. of this being accounted for as acetic acid. More recently, Scott, Fred and Peterson ("Ind. Eng. Chem.," 1930, *22,* 731) have reported an investigation in which cellulose was fermented at 55° to 65° C. by enrichment cultures of thermophillic bacteria, acetic acid constituting 45 to 65 per cent. of the end products. The work of Norbury on the production of ethanol, acetone and acetic acid (Brit. Pat. 222,549) must also be mentioned; he and his associates found that *Bacillus acetothylicus* fermented hydrolysed straw, grasses, etc., producing substantial quantities of acetic acid.

At present, however, our knowledge of cellulose-destroying organisms and of methods for controlling or regulating their activities is decidedly limited, and the situation is in much the same state as that of, for example, the lactic acid fermentation in 1870.

Butyric Acid

The butyric acid fermentation was first recognised by Pasteur ("Compt. rend.," 1861, *52,* 344), who described it as an anaërobic process. Various organisms, all rather closely related, were held responsible for the formation of the acid from sugar. Ultimately, Baier ("Centr. Bakt.," 1895, *1* (2), 17, 84, 118) differentiated six groups of organisms, as well as many sub-groups, which were capable of bringing about a butyric fermentation. Of these, *Bacillus butyricus* is one of the most important.

Butyric acid formation in fermentation processes is generally accompanied by other reactions producing a variety of substances. According to Buchner and Meisenheimer ("Ber.," 1908, *41,* 1410), in a typical fermentation of glucose by *Bacillus butyricus* 100 gram of glucose with nutrient salts and calcium carbonate gave 0.7 gram butanol, 2.8 gram ethanol, 1.6 gram hydrogen, 3.4 gram formic acid, 10 gram lactic acid, 7.5 gram acetic acid, and 26 gram butyric acid. Kirov ("Centr. Bakt.," 1911, *31* (2), 534) obtained somewhat similar results with two types of butyric bacteria isolated from molasses. He found the fermentation of sugars by these organisms to be characterised by the formation of substances, other than butyric acid, such as acetic and lactic acids.

Considerable work has been done in attempts to elucidate the intermediate steps which are involved in the formation of butyric acid and the compounds usually accompanying it by the fermentation of sugars. From the data so far accumulated it appears that methyl glyoxal, resulting from the fission of the hexose molecule, is first formed, then broken down to acetaldehyde and formic acid, and the latter is split still further to carbon dioxide and hydrogen. The aldehyde gives rise to acetic acid and ethanol and may also condense to aldol, from which butyric acid, β-hydroxy-butyric acid, butanol and acetone are formed. The lactic acid arises directly from methyl glyoxal.

The latent literature describes several processes that may be of industrial promise, but commercial exploitation of any fermentation process for producing butyric acid must depend very largely upon the development of satisfactory means for the separation and recovery of other products of economic importance.

Citric Acid

The first important step on citric acid fermentation was the work of Thom and Currie ("Journ. Agric. Research," 1916, *7,* 1) who overthrew the idea that the black *Aspergilli* were exclusively oxalic acid formers. After this, Currie ("Journ. Biol. Chem.," 1917, *31,* 15) undertook an investigation of the factors controlling the production of citric acid by a selected strain of *Aspergillus niger.* By using proper concentrations of sucrose (about 15 per cent.) supplying the nutrient nitrogen in the form of low concentrations of ammonium nitrate, and adjusting the initial *p*H of the culture solution to 3.5 by addition of hydrochloric acid, he was able to almost completely suppress the formation of oxalic acid and obtained a rapid fermentation, with little loss of citric acid through consumption by the organisms, as long as any sugar remained.

Most of the recent literature deals with factors influencing the fermentation and with attempts to throw some light on the mechanism of the reactions involved in the interesting transformation by which the branched-chain compound is produced from sugars in which no such structure exists. In 1909, Herzog and Polotzky ("Zeit. Physiol. Chem.," 1909, *59,* 125) observed that citric acid was formed from 3- and 5- as well as from 6- and 12-carbon sugars, thus making it necessary to introduce a condensation reaction into the process if the saccharinic theory was to hold. Wehmer ("Ber.," 1925, *58,* 2616) pointed out that calcium gluconate was converted into citric acid by *Aspergillus niger* and concluded that it was possible that the degradation of glucose by that organism might proceed from glucose to gluconic acid to citric acid to oxalic acid and eventually to carbon dioxide.

Amelung ("Zeit. Physiol. Chem.," 1927, *166,* 161) reported the results of a large number of experiments in which he cultivated varieties of *Aspergilli* on 3-, 4-, 5-, 6-, 7- and 12-carbon sugars, and obtained the maximum yield of citric acid from sucrose. Bernhauer ("Biochem. Zeit.," 1928, *197,* 309, 327) found that inulin and fructose approached sucrose as good carbon sources for the acid, and the yields with these three compounds were much greater than those obtained when other sugars were employed. As the yields from the fructose fragments of sucrose were higher than those from fructose itself, it was suggested that the structure of the fructose residue of the sucrose molecule has special significance in the formation of citric acid.

The production of citric acid by mold fermentation of sucrose was attempted on an industrial scale in Germany more than 30 years ago, but so many difficulties were encountered that the process was unable to compete successfully with that based on the recovery of the acid from citrus fruits, and was therefore abandoned. It is only within the last seven years that fermentation has taken a prominent place in the citric acid industry. The successful exploitation of this process has been accomplished through intensive research, and methods for carrying it out on a large scale have been kept secret. The process, however, consists of a shallow-pan fermentation of sucrose by a strain of *Aspergillus niger,* and the reaction is completed in probably less than nine days.

The quantity of fermentation citric acid produced in the United States is estimated to be 3,500 to 5,000 tons per year. Its volume may be realised from the fact that this country is now not only independent of imported citric acid but is actually exporting it to Europe.

Fumaric Acid

It was Wehmer ("Ber.," 1918, *51,* 1663) who announced the isolation of a strain of *Aspergillus,* closely related to *Aspergillus niger,* which produced fumaric acid from sucrose in quantities equivalent to 60 to 70 per cent. of the sugar used. He gave the name *Aspergillus fumaricus* to this organism and proposed to oxidise the resulting fumaric acid to tartaric acid, thus establishing a source for tartaric acid independent of the wine industry.

The mechanism by which fumaric acid is formed from sugars by molds is obscure. Gottschalk ("Zeit. Physiol. Chem.," 1926, *152,* 136; 1927, *172,* 314) has reported that *Mucor stolonifer* transforms pyruvic acid to fumaric acid, but other investigators have questioned his results. Butkewitsch and Fedoroff ("Biochem. Zeit.," 1929, *206,* 440, *207,* 302; 1930, *219,* 87) seeking to clarify the question of formation of the acid by *Mucor stolonifer,* reported that with a relative deficiency of nitrogen and in the presence of calcium carbonate, fumaric acid accumulated in appreciable quantities, at times in yields representing 30 to 40 per cent of the sugar consumed. Succinic acid was present in the fermented solutions. When acetic acid was used as a carbon source, 80 per cent. of the ether-soluble acid formed was succinic acid and 20 per cent. fumaric acid, but when sugar was added to the acetic acid substrate the values for the respective acids were 26 and 74 per cent. They are of the opinion that ethanol is an intermediate in the transformation of sugar to fumaric acid by molds.

Further work on the production of fumaric acid by molds might possibly develop a fermentation whereby this compound could be produced economically. If used for the production of tartaric acid the yields of fumaric acid would have to be very high and the raw material would have to be quite inexpensive in order to compete with the well-established industry which is based on the recovery of tartrates from wine lees.

Formic Acid

Formic acid occurs widely in anaërobic yeast and bacterial fermentations, apparently arising directly from the 3-carbon intermediate, methyl glyoxal. In some cases, notably in the fermentation of sugars by *Bacillus coli communis,* the acid is still further broken down into carbon dioxide and hydrogen, and, according to Grey, the hydrogen thus liberated seems to play an important part in determining the extent to which other products, such as acetic and succinic acids and ethyl alcohol, are formed ("Proc. Royal Soc.," Ser. B. 1918, *90,* 75; 1920, *91,* 294).

Formic acid, however, can be made so easily and cheaply by synthetic methods that it is doubtful if any process based on the use of micro-organisms will prove to be of commercial importance.

(To be continued.)

Personal Notes

MR. C. F. THACKRAY, a prominent Leeds manufacturing chemist, was found drowned in Waterloo Lake, Roundhay Park, Leeds, on Sunday.

MR. H. EDWIN COLEY has resigned from the board of the Zinc Manufacturing Co. Messrs. S. C. E. Lloyd, W. F. C. McClure, J. C. Lloyd and K. R. D. Morrice have been elected to the board.

SIR WILLIAM ALEXANDER was re-elected president at the eighteenth annual meeting of the National Union of Manufacturers in London last week. Mr. C. S. Garland was re-elected hon. treasurer and vice-president, and Sir Harry McGowan was reappointed on the executive committee.

PROFESSOR IGNACE MOSCICKI, president of the Polish Republic, celebrated the 30th anniversary of the beginning of his scientific career on December 7. He claims to have made about 30 discoveries in chemistry and electricity.

MR. ALFRED MARSDEN, one of the Glasgow representatives of the Vacuum Oil Co., who completed forty-five years' service with the company last February, has retired. Mr. Marsden held the company's long service record. He joined it in Liverpool in 1889, three years after it was established, and he is one of the few survivors of the company's early days. On his forty-fifth anniversary with the company, Mr. Marsden received a presentation from his colleagues.

MR. J. M. ARMEL, manager of the Vacuum Oil Co.'s Birkenhead works, has retired after twenty-eight years' service in that capacity. On his retirement, Mr. Armel was presented by Mr. Wilson Cross, chairman of the company, with a clock, to the cost of which all the 316 employees at the Birkenhead works contributed. Mr. Armel saw the beggining of what is now the biggest grease-making plant in Europe. After considerable experience in grease-making in America, he joined the Vacuum Oil Co., to take over the management of the Birkenhead works, and to erect and start a new plant for the manufacture of lubricating greases. Mr. Armel is being succeeded by Mr. W. S. Church, who has been his assistant manager.

SIR HARRY MCGOWAN was the principal guest at a luncheon in the City Chambers, Glasgow, on December 6, given by Lord Provost A. B. Swan.

MR. A. J. KER, labour manager of the Scottish Dyes (Grangemouth), has been transferred to Manchester, where he will take over the managership of the Dyestuffs Group.

MR. ARTHUR D. STORKE has been appointed to the board of the American Metal Co., and Dr. Otto Sussman, president, has been elected chairman. Mr. Harold K. Hochschild is to become president, and Mr. Walter Hochschild has been appointed secretary.

MESSRS. H. A. TRENEAR-THOMAS and L. Rigg have retired from the board of the Associated Dyers and Cleaners, Ltd., and Messrs. George E. Leavey and R. H. Griffiths have been appointed in their place. Mr. G. E. Leavey has been appointed chairman and Mr. Frank Eastman deputy-chairman, while a local board consisting of Messrs. H. D. Drysdale, F. Walker and L. Rigg has been formed at the Acton works.

MRS. WALDSCHMIDT-LEITZ, whose husband was to have addressed the Food Group of the Society of Chemical Industry in London, on Wednesday, telegraphed to the hon. secretary of the Group on Tuesday: "My husband is unable to continue his voyage getting a fainting fit through intolerable pain at the slightest attempt to walk. We had to get him off the train at Leipzig last night. Inconsolable at having to disappoint you." In the circumstances both the luncheon and the meeting had to be cancelled.

COLONEL ALEXANDER MITCHELL, a well-known figure in East Scotland, died on December 5, aged 63. He was chairman of the Alloa Coal Co. and of the Alloa Glassworks Co., and a director of several other coal and shipping firms; commander of the Fife and Forfar Yeomanry, and for 25 years master of the Lauderdale Foxhounds. His elder son, Mr. Harold Mitchell, is M.P. for Brentford and Chiswick.

MR. C. I. KELLY has resigned his position as assistant chief chemist to the Anglo-American Oil Co., Ltd., and has been appointed chief chemist to Herbert Green and Co., Ltd.

Annual Ramsay Chemical Dinner

Scotland's Need for New Industries

THE twelfth annual Ramsay Chemical Dinner was held at the Central Station Hotel, Glasgow, on December 7. This dinner is promoted by the Chemical Society, the Glasgow Sections of the Institute of Chemistry, the Society of Chemical Industry, and the British Association of Chemists, the Scottish Section of the Society of Dyers and Colourists and other chemical societies in Glasgow. Over two hundred people attended, including representatives of the principal chemical societies. The Chemical Society was represented by Professor G. G. Henderson, a past-president, the Institute of Chemistry by Dr. A. E. Dunstan, and the Society of Chemical Industry by the president, Alderman Edwin Thomson, J.P.

Scotland is not Decadent

Sir JAMES LITHGOW proposed the toast of the "Profession of Chemistry." He said that while the chemist could bring beauty out of the waste places of the earth he had not yet succeeded in eliminating from human nature its inherent qualities of malice, envy and laziness. Without the discoveries of such men as Sir William Ramsay and James Watt we might have been as happy a community, but we would have had but a fraction of that wealth and opportunity which man had striven after from the beginning of time. The discoveries of science gave this generation vast potential advantages and it was for us to learn how to use and enjoy these advantages. Some people were suggesting that Scotland was decadent and there were many phases of public as well as of private life which would justify such suggestions. We must stand or fall by our own works, not by those of someone else either of this or a former generation.

Industry—running a business for profit and providing work for our fellow citizens—was looked upon by some people as a dubious calling. It was certainly risky but, if a fair proportion of the rising generation was not prepared to enter industry with the fixed intention of winning the prizes it had to offer, then, so far as Scotland was concerned, the work of our pioneers would be for nought. Sir James refused to take such a gloomy view and to believe that a people of our virility would continue to tolerate a policy of providing at the public expense education, public services, even public assistance, without seeing to it that those who had the brains or the muscles used them to pay back what had been provided to start them in life or to tide them over a time of trouble. In Scotland, that repayment could only come through the development of productive enterprise—vigorous leadership by those so gifted who had the opportunity, and willing service by those less fortunately placed.

The Southward Drift of Industries

Sir JAMES IRVINE, Principal of St. Andrews University, in reply, reviewed the changes which had taken place in the chemical industries of Scotland. At the beginning of the century chemical manufacturers were still enjoying the impetus gained by the work of the pioneer inventors. Each discovery then carried new industries in its train and there was still room for the small manufacturer as well as for the larger units with interlocking interests. Nowadays new conditions had to be contended against and the report on Scottish chemical industries issued by the Scottish National Development Board had shown that the economic limit over which raw materials could be collected and finished products distributed had, in some chemical industries, diminished almost to vanishing point. The southward drift of old-established industries was in no way connected with Scotland's political position nor could it have been prevented by local autonomy.

The prospects, said Sir James, were gloomy but not entirely dark, because genius and inventiveness, backed by the driving force of human personality, had often, in the past, triumphed over material limitations and in the end had defied economic laws. Scotland was rapidly approaching the position where new industries would be required to take the place of those which were becoming obsolete or had migrated elsewhere. What these new ventures might be it was impossible to forecast. One thing was certain—the rapid advance of civilisation would create demands as yet unimagined, and the country which was the first to recognise these needs would be the first to satisfy them if that country had produced a race of thinkers and workers who had the requisite faith, courage and imagination. At this stage, Sir James expressed the view that the scientific training in this country is over-regimented and criticised chiefly the extreme specialisation and almost mechanical quality of much of the work now termed research. Many students at present engaged in research would be infinitely better employed in supplementing their academic knowledge by a training in the methods whereby science was operated in industry and in the conduct of the practical affairs of life. Research in the academic sense had become a fashion; it would soon become a trade and then farewell to the hopes that this country would again produce the few particular men who, in flashes of genius, had turned discovery into invention and invention into industry. Scotland was not lacking in the qualities which were needful.

The toast of the Lord Provost was proposed by Sir James Irvine and the Lord Provost, Mr. A. B. Swan, suitably replied. The toast of the guests was proposed by Mr. A. R. Jamieson and Professor G. Barger replied.

Far Eastern Chemical Notes

Japan

AMMONIUM PERSULPHATE MANUFACTURE is contemplated by the Shiuko Kagaku Kogyosho at their factory at Itabashi.

A SAFETY GLASS FACTORY is to be built in Osaka by the Nippon Anzen Glas K.K., which has been registered with a capital of 300,000 yen.

CHLORINATED RUBBER is now being produced in Japan by three concerns: the Asahi Glass Works, the Kansai Colour Co., and the Takada Co.

A NEW COKING PLANT, with an annual capacity of 8,000 tons of tar, is to be erected at the Wanishi steel works of Nippon Seitetsu K.K., at a cost of 155,000 yen.

THE UBE NITROGEN CO. is increasing its capital from 5 million to 10 million yen and plans to double its present ammonium sulphate production of 50,000 tons per annum.

THE PRODUCTION OF AMMONIUM CHLORIDE is steadily expanding and complete satisfaction of the home demand is expected by the end of this year.

A NEW PAPER FACTORY using mulberry bark as raw material will be shortly erected by a new concern, the Fuso Paper Company. The process is based upon treatment with hydrochloric acid.

KEEN DEMAND FOR SULPHUR has resulted in a new company being formed, Takamatsu Yuokogyo K.K., with a capital of 250,000 yen. It is intended to build a factory at Sugawa, in the province of Akita.

JAPANESE INTERESTS have under consideration the establishment of a wood pulp factory in Korea with a capital of 5 million yen and an annual pulp production of 15,000 tons. Another centre of interest for the wood pulp industry is Formosa where the firm of Taiwan Kogyo K.K. is now being formed, with a capital of 10 million yen, to manufacture wood pulp and paper pulp.

China

NEW TIN DEPOSITS ARE BEING EXAMINED by the Government authorities in the Kwangsi province and an annual output of 20,000 tons over a period of 70 years is anticipated.

THE NEWLY-COMPLETED PLANT of the China Alcohol Distillery at Shanghai, with a daily production capacity of 4,000 to 6,000 gallons spirit, is the largest of its type in the country. The share capital of 1.5 million Chinese dollars has been partially transferred to the Chinese Government.

Chemical Imports in India

An Increase of 10 Per Cent. Reported

A SURVEY of the import trade of India during the first three months of the fiscal year, April 1 to June 30, 1934, prepared by the senior British Trade Commissioner in India, and published by the Department of Overseas Trade, states that during the three months ended June, 1934, the value of the total imports increased, as compared with the corresponding period of 1933, by Rs.3 crores* or 10 per cent. and amounted to 31 crores and the total exports, including re-exports, rose by Rs.3,79 lakhs or 11 per cent. to Rs.38 crores. The grand total of imports, exports and re-exports amounted to Rs.69 crores as against Rs.62 crores, an increase of Rs.7 crores or 11 per cent.

The total trade in paints and colours fell in quantity from 85,981 cwt. to 79,129 cwt., but rose slightly in value from Rs.17 to Rs.17¼ lakhs. The United Kingdom share fell slightly from 42,953 cwt. (Rs.11½ lakhs) to 40,906 cwt. (Rs. 11¼ lakhs) and that of Germany from 13,172 cwt. (Rs. 2 lakhs) to 6,339 cwt. (Rs. 1¾ lakhs).

A further fall is recorded in the total soap trade from 82,028 cwt. valued at Rs.20½ lakhs to 65,749 cwt. valued at Rs.19 lakhs. The United Kingdom share fell from 66,852 cwt. (Rs.17¼ lakhs) to 56,561 cwt. (Rs.16 lakhs) and that of "other countries" from 15,176 cwt. (Rs.3¼ lakhs) to 9,188 cwt. (Rs.3 lakhs). The imports of soap were divided as follows: Household and laundry soap 54,105 cwt. (Rs.10¾ lakhs); toilet soap 10,810 cwt. (Rs.8 lakhs); other sorts 834 cwt. (Rs.¼ lakh); total 65,749 cwt. (Rs.19 lakhs).

Notwithstanding the severe depression and reduced purchasing power, the total imports of chemicals rose materially from Rs.62 to Rs.75¼ lakhs, which tends to show that there is a marked improvement in Indian industrial activity. No details are available of the countries of origin, but particulars of the total imports under each of the principal headings are given as follows, the corresponding figures for 1933 being shown in parentheses: Acids, 2½ Rs. (lakhs) (1½); bleaching powder, 2¼ (2¼); carbide of calcium, 2½ (1½); copper sulphate, ¾ (½); disinfectants, 2 (2); glycerine, 1½ (¾); potassium chlorate, 2½ (3¼); sodium bicarbonate, 2 (2); sodium carbonate, 10½ (14½); sodium cyanide, ¾ (½); caustic soda, 11½ (8); sodium silicate, ¾ (½); sulphur (brimstone), 3 (3).

The total imports of drugs and medicines advanced from Rs.39½ to Rs.46½ lakhs due to materially increased imports of miscellaneous drugs and quinine salts. Details of the countries of origin are not available, but the following represents the total imports in each of the principal items, 1933 figures being shown in parentheses: Camphor, 5 Rs. (lakhs) (5); proprietary and patent medicines, 4¾ (9); quinine salts, 7½ (5½); saccharine, 1 (1¼).

After a further severe decline during the past few years, it is encouraging to note that the total imports of dyes obtained from coal tar during the quarter rose from Rs.34¼ to Rs.64 lakhs in value. Total imports from all sources under each main heading were as follows: *Alizarine*—Moist—i. Not exceeding 16 per cent., ½ Rs. (lakhs) (½); ii. Over 16 per cent. but not exceeding 20 per cent., 4 (1¾); iii. Exceeding 20 per cent., 1; *Congo red*, 3½ (1); *Coupling dyes of the naphthol group*—i. Naphthols, rapid fast colours (rapid salts) and bases, 8¾ (4½); ii. Other salts, 3 (1); *Vat dyes*—i. Indigo, 4¾ (4); ii. Other sorts—(*a*) Paste, 2 (1½); (*b*) Powder, 12¾ (8¼); *Sulphur black*, 3½ (1½); *Metanil yellow*, 1½ (½).

* Rupees one lakh (Rs.1,00,000) = £7,500 at 1s. 6d. exchange. Rupees one crore = Rs.100 lakhs = £750,000.

Scientific Glassware

First British Standard Specifications Published

THE British Standards Institution has just issued specifications for distillation flasks and for interchangeable conical ground glass joints. These specifications are the first glassware specifications to be issued by the Scientific Glassware Committee, which was taken over from the Institute of Chemistry when the Chemical Division of the Institution was formed.

The Distillation Flask Specification (No. 571) provides for a complete series of 14 flasks ranging from a distillation capacity of 30 ml. to 3,000 ml. Prior to the publication of the specification over this range of capacity, four manufacturers were making between them flasks having 20 different nominal capacities, and having 40 different bulb capacities. The general adoption of the standard series will therefore not only diminish the different sizes of flasks now being made, but will also ensure identity of actual capacity between flasks having the same nominal capacity.

The following conditions are fulfilled by each flask in the series:—The centre of the side tube is 75 mm. from the top of the neck. The centre of the side tube is 90 mm. from the liquid surface when the flask is vertical and contains a quantity of liquid equal in volume to the distillation capacity of the flask. The bulb capacity is 30 per cent. greater than the distillation capacity.

The first condition ensures the same immersion of the stem of the thermometer in each size of flask, the thermometer being placed so that the top of the bulb is level with the bottom of the side tube at its junction with the neck. Thermometers calibrated for 100 mm. immersion are convenient for use with the flasks. When the thermometer is fixed as directed above, the immersion line of the thermometer will be in the neighbourhood of the top of the cork holding the thermometer in position in the neck. The second condition helps to secure reproducibility of results in distillation by ensuring that the thermometer bulb is at a constant distance from the level of the liquid surface at the beginning of a distillation. The third condition ensures a definite bulb capacity for each nominal capacity, the bulb capacity being taken as 30 per cent. greater than the distillation capacity. Variation was found in the bulb capacity of flasks from different sources having the same nominal capacity.

The Specification for Ground Glass Joints (No. 572) has been prepared to secure the interchangeability of conical ground glass joints in laboratory and industrial glassware. In order to ensure interchangeability, taper, diameter of larger end of socket, diameter of smaller end of cone, and length of ground portions of cone and socket, have been specified for each joint. A taper of 1 in 10 on diameter, equivalent to a cone semi-angle 2° 51′ 45″ has been adopted for all joints.

To meet the requirements of different types of apparatus, four series of standard joints designated Series A, Series B, Series C and Series D have been provided. The dimensions for the standard Series A have been chosen to fit in with foreign standards already in existence. Joints in the additional series have the same diameter at the larger end as the corresponding joints in Series A, but have different lengths of engagement:—Series B three quarters, Series C a half, and Series D a quarter the length of Series A. The four series of joints together afford a very wide choice so that provision is made for the replacement of existing joints and for special requirements. The dimensions and tolerances specified were adopted after very careful measurement and examination of conical ground glass joints in present-day use. This work was carried out at the National Physical Laboratory.

Copies of these specifications (Nos. 571 and 572-1934) can be obtained from the British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

Some Recent Developments in Wool Research

Society of Dyers and Colourists

A MEETING of the Scottish Section of the Society of Dyers and Colourists was held at the Royal Technical College, Glasgow, on November 30, when a paper was given by Dr. Henry Phillips, F.I.C. (Wool Industries Research Association) on "Some Recent Developments in Wool Research." Mr. James Bruce presided.

The X-ray investigations of Astbury and others and the physical and chemical researches of Speakman and his collaborators have provided a relatively simple picture of the structure and essential constitution of wool fibres. The chemistry of these fibres can now be regarded as that of long polypeptide chains, linked by covalent disulphide groups formed between cysteine side chains from adjacent molecules, and by electrovalencies formed between the side chains derived from decarboxylic acids and diamino-acids. These electrovalencies are destroyed when wool fibres combine with acids and alkalies (Speakman and Scott, "Trans. Faraday Soc.," 1934, *30*, 539).

The "chemical" picture of wool keratin affords an explanation of the swelling of wool (Meunier and Rey, "J. Internat., Soc. Leather Trades Chemists," 1927, *11*, 508) in acid and alkaline solutions, whilst the hydration which accompanies swelling can be attributed partly to dipole association and co-ordination between water molecules and the active polar groups in the side chains (Lloyd and Phillips, "Trans. Faraday Soc.," 1933, *29*, 132). This hydration decreases the amount of work required to extend wool fibres (Speakman and Birst, "Trans. Faraday Soc.," 1933, *29*, 148).

In the present paper the bearing of the results of these constitutional and chemical researches on the raw wool scouring, milling and bleaching processes was discussed. Wool is scoured most effectively in solutions of soap and soda with *p*H values near 10, but the alkali demand of raw wool is considerable and varies from wool to wool. Some idea of the extent of this variation can be obtained from the *p*H values of the water extracts of some raw Australian merino wools which ranged from *p*H 5.5 to 8.4 *p*H. Determinations of the *p*H values of the liquors of a commercial scouring set are quoted to show that owing to lack of scientific control, the alkali demands of the wool are sometimes not satisfied during scouring. This causes the *p*H values of the liquors to diverge from the optimim values and loss of scouring efficiency and unevenness in the cleanliness of the wool results. A further source of irregularity in the quality of the output may arise from incomplete rinsing, so that the wool is too alkaline for the subsequent mechanical processes. The possible connection between this problem and the work of Speakman, Stott and Chang ("J. Textile Inst.," 1933, *24*, 273) on milling was also reviewed.

The *p*H range within which the usual bleaching processes are carried out is a factor deciding the type of bleached finish obtained. Sulphur stoving subjects the wool to very acid conditions, neutral bleach (King, "J. Soc. Dyers-Colourists," 1930, *46*, 225) functions within the *p*H stability of wool, whilst peroxide bleaching takes place in alkaline solutions. Reasons were given, based on the constitutional and chemical researches described, why these bleaches each give a different finish which contributes to the final appearance of the bleached fabrics.

Glass Enamels in Industry

One of Scotland's Newest Enterprises

ONE of Scotland's newest industries was referred to by Mr. E. E. Geisinger, B.Sc., of Enamelled Metal Products Corporation, when addressing a joint meeting of the Glasgow Sections of the Society of Chemical Industry, the Institute of Chemistry, and the Institute of British Foundrymen, at the Royal Technical College, Glasgow, on November 30. Dr. Geisinger was speaking on "Developments in Silicate Enamels and their Industrial Application." and, in outlining the varied uses found for enamelled metal ware, he said that glass enamelled steel equipment could be found in nearly all industries where storage or processing receptacles were required. It was without doubt the one equipment material which had the fewest limits, and this could be said in due respect to all ferrous or non-ferrous alloys, as well as stoneware or glass products. When the size of the unit was around 1,000 gallons or over, the price of the equipment per unit gallon was a recommendation, whilst for smaller units the quality and freedom of any contamination to the product being processed was much in the favour of enamelled metal ware.

Mr. Geisinger said that the enamelling industry had, in the past, suffered largely from a policy of secrecy. Particularly in Germany, formulæ had been worked out and handed down as a family tradition. Nowadays, the Pfaudler organisation, which was associated with Enamelled Metal Products Corporation, had made a point of publishing nearly all their work. He showed, by means of slides, that enamels were by no means homogeneous and that by viewing a cross-section of an enamel the ground coat could be seen quite distinct from the succeeding coats. He then described the modern methods of processing silicate-coated metal ware and referred to "wet" and "dry" processes. The object of the good enameller was to apply the thinest possible coat of glass enamel because it has been found that a heavy base of metal covered with a thin skin of glass gives years and years of service. Muffle furnaces were not very suitabie for firing objects of irregular shape, as radiant heat was not sufficient. If a furnace of this type was employed, then a fan made of heat-resisting non-corrosive material was necessary to create a positive draught. When the size of the unit was around 1,000 gallons or over, the price of the equipment per unit gallon was a recommendation, while for smaller units the quality and freedom of any contamination to the product being processed was much in the favour of enamelled metal ware.

Glass-enamelled steel could be heated and cooled severely without damage, and its smooth surface allowed of easy and thorougn cleaning, whilst it could be sterilised with an assurance that the surface was not harbouring spores which resist sterilisation. It was ideal for the storage of liquids, and for neutral liquids like beer or milk, the size of the tank was only limited by the size of the enamelling furnace and storage facilities. Present-day glass enamels contained no ingredients of a poisonous nature like lead, antimony or arsenic. Enamelled metal ware also resisted corrosion, and one of the most permanent protections for steel was a coating of fused silicate glass.

The types of furnaces used for firing enamelled ware were described by the lecturer, who said that there had been erected at Leven, Fife, an enamelling furnace which was as big as any in the world and which, in spite of its size, had reached a surprising degree of efficiency.

PHOSPHATE is produced in Estonia, at Ulgaste. This plant employs about 75 workers and produces about 3,000 tons of ground phosphate annually. The production of Estonian phosphate, which is used entirely for fertilisation purposes, has risen appreciably in the last two years, as a result of Estonian import restrictions. It appears that the Estonian phosphate, however, cannot entirely replace the imported superphosphates.

Notes and Reports from the Societies

Society of Public Analysts

Election of New Members

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, London, on December 5, Professor W. H. Roberts, vice-president, being in the chair.

Certificates were read in favour of: Henry Dryerre, Ronald W. Hoff, Laurance J. S. Lane, and Alfred E. Wright. The following were elected members of the Society: Arthur J. Amos, Harry R. Fleck, Walter Lee, Edward B. Parkes, Francis C. Storrs, James Thompson, and Robert S. Watson.

A Specification for Enamelled Hollow-ware

The question of a specification for enamelled hollow-ware was introduced by Dr. J. H. Coste, F.I.C., and Dr. D. C. Garrett, B.Sc., F.I.C. The enamel on enamelled ironware has been found to be dissolved to a considerable extent by comparatively weak solutions of organic acids, the solubility depending upon the strength of acid and duration of contact. A specification for "acid resistance" of enamelled ware was based on these results. In the manufacture of enamels it is not sufficient to avoid the use of known antimony compounds; the absence of antimony from the constituents should be ensured. Acid extracts of enamels may also contain appreciable quantities of boron and a significant amount of fluorine.

In a subsequent paper, Mr. R. H. Burns, B.Sc., A.I.C., reported that antimony compounds are extracted from "hard" enamels by the action of dilute citric acid solutions. Cleaning and scouring enamel vessels exposes a new surface to the action of the citric acid, with consequent increase in the antimony extracted. Storage of citric acid solutions in enamelled vessels is therefore dangerous, owing to the rapid increase in the antimony-content of the stored solution. A slightly modified method for determining antimony in such solutions was described.

Institute of Chemistry

Leeds Section: Modern Alchemy

POST-WAR advances in the study of naturally occurring substances were dealt with by Professor J. M. Heilbron in a lecture delivered to the Leeds Section of the Institute of Chemistry on November 26. The lecturer included a reference to the studies of Haworth and Hirst on the constitution of the carbohydrates, and especially to the spectacular success that has been achieved in the study of ascorbic acid (vitamin C), the accessory food factor responsible for the curation of scurvy. This work has culminated in the synthesis of ascorbic acid by the Birmingham School and almost simultaneously by Reichstein.

The synthetic experiments of Robinson and collaborators into the nature of the anthocyanins, the water soluble pigments of flowers, berries and leaves, have shown that these pigments fall into a comparatively restricted number of categories in so far as the position occupied by the sugar residue is concerned. Attention has also been directed to the flavines, another series of water soluble pigments. The constitution of lactoflavine, which is seemingly vitamin B_2, the factor connected with growth and pellagra dermatitis in young rats, has been successfully elucidated by Kuhn and his collaborators, who have also effected the synthesis of the photoproduct, lumilactoflavine. The researches of Karrer, Kuhn Zechmeister and Winterstein have led to an understanding of the exact constitutional relationships existing between several members of the carotenoid pigment series.

The transformation of the various carotenes into vitamin A was described by Professor Heilbron, together with the elucidation of the constitution of the latter by Heilbron and Karrer. Finally, a résumé of the outstanding advances made since 1932 in the study of sterols, bile acids and related substances, including the sexual hormones, was followed by a reference to the elegant researches of Kögl into the nature of the auxines, the plant cell-extension hormones.

Iron and Steel Institute

Symposium on the Welding of Iron and Steel

AT the suggestion of the Department of Scientific and Industrial Research, the Iron and Steel Institute, in conjunction with other scientific societies and technical institutions, is proposing to organise a symposium on the Welding of Iron and Steel, to be held May 2-3, 1935, on the occasion of the annual meeting of this Institute.

The general objects of this symposium will be (*a*) to review the position of welding in all its industrial aspects, both in Great Britain and in other countries; (*b*) to obtain knowledge of the problems encountered in welding as employed by the various industries in Great Britain and in other countries; (*c*) to reveal what research work has been or is being undertaken: and (*d*) to consider the advisability of taking steps to co-ordinate research work and to stimulate and guide future research, possibly with a view to formulating a national scheme. It is intended to print papers which are presented at the symposium as well as the resulting discussions, etc., and to issue the proceedings as a bound volume.

Society of Chemical Industry

Nottingham Section: Ceramics and the Chemical Industry

COMMON clays are mixtures of varying properties, and the production of clay bodies is usually accomplished as a result of empirical experimentation, said Mr. G. N. Hodson in a paper on "Ceramics and the Chemical Industry," read before the Nottingham Section of the Society of Chemical Industry, on December 6. Chemical stoneware can be graded by porosity, or water absorption. Earthenware differs from stoneware in that it has a porous body, and is made watertight by a covering of glaze, whilst stoneware can be obtained with a dense non-absorbent body.

In the manufacture of stoneware the clay and non-plastic materials are ground together and made into a plastic mass with water, and pressed into plaster-of-paris moulds. Water is absorbed from the clay by the mould, the clay stiffens and shrinks, and in the course of a week or two all the added water is driven off and the dry clay body, shaped in accordance with the mould, remains. The clay shape is then fired in a kiln, up to 1,200-1,300° C., and allowed to cool slowly. The firing process takes 2 to 3 weeks.

Cheapness in first cost, cleanliness in use and complete freedom from corrosion, are the main assets of stoneware. Resistance to heat changes; stoneware has a low coefficient of heat conductivity, and rate of change of temperature and difference in temperature throughout the vessel are important factors. The composition of the stoneware body largely determines the resistance to heat changes, but shape and size of article also influence the result. Direct flame heating is usually unsuitable; heating by hot gases, or heating in sand or hot water bath, are suitable for all sizes of vessels. In heating liquor in vessels by a steam coil, care should be taken not to impinge live steam directly on to stoneware.

Iron-armoured stoneware piping is now obtainable for high temperatures and pressures. Tanks and vessels can be made economically in one piece up to about 600 to 700 gallons capacity. White stoneware ensures absolute cleanliness for pharmaceutical and food products industries.

Liverpool Section: The Alkali Industry

DR. J. T. CONROY, B.Sc., Ph.D., F.I.C., delivered the Hurter Memorial Lecture to the Liverpool Section of the Society of Chemical Industry on December 7, his subject being "The Alkali and Associated Industries—a Retrospect."

Contrasting the positions occupied by inorganic and organic chemistry in theory and practice here and abroad, the lecturer referred to changes in relative importance of the two branches brought about by later research. Following the rapid growth of the ammonia-soda process and the new attack by electrolytic methods on the chlorine side, a decline

in the manufacture by the Leblanc process set in and by 1914 this process was doomed. In 1888, Dr. Hurter gave an address indicating the possibilities of electrolytic manufacture and the speaker referred to the outstanding difficulties—chemical and electrical—which were met with at that time. Chemical troubles were successfully overcome by the work of Castner and Hargreaves, and by the introduction of Acheson graphite an improvement in anode material was effected. Finally, developments in cell construction and power production led to the complete disappearance of Leblanc manufacture in this country. Certain portions of the Leblanc cycle still survive, *viz.*, vitriol and saltcake, and the lecturer dealt with the later stages of caustic soda, chlorine and bleaching powder common to Leblanc and electrolytic processes.

In dealing with vitriol, Dr. Conroy outlined changes in the chamber system, such as replacement of steam by water sprays, nitre potting by ammonia oxidation, etc., and in briefly reviewing methods of concentration he emphasised the value of the modern contact process. Drawing attention to the manufacturing difficulties arising from the ore, the lecturer spoke of the ease of working afforded by brimstone as a raw material and mentioned the remarkable developments in sulphur production by the Frasch process in the United States. Referring to the great decline in home production of saltcake, he attributed this to the death of Leblanc soda, the change in methods of glass production and the development from natural sources in Germany. Consequent reduction in the output of hydrochloric acid had been made good by the manufacture of synthetic acid—a complete reversal of older methods and aims.

Regarding chlorine and bleaching powder, attention was drawn to the growing use of liquid chlorine, to the almost complete change in methods of absorption by lime, and improved stability of the product. Equally far-reaching changes in the working of caustic soda liquors were outlined by the speaker. After drawing attention to the much greater purity of products—alkali and acid—resulting from the developments outlined, he referred briefly to the marked improvement in working conditions.

Plastics Group and Institute of the Plastics Industry

Urea Plastics

THE manufacturer who contemplates entering the field of aminoplastics can now rely upon obtaining his raw materials but there is an awkward fence for him to climb in the shape of patents before he can come on to the market with a clear conscience and without fear of litigation, said Mr. Kenneth M. Chance, in a paper which he read at a joint meeting of the Plastics Group and the Institute of the Plastics Industry, held in London, on November 21.

In 1929 the only aminoplastic powder in this country took more than ten minutes to cure in a beaker or cup mould, it had to be subjected to prolonged breathing, the range of temperature within which good mouldings could be made was limited to about 5° C., each batch was liable to require a different method of treatment, and the personal equation of the moulder was one of the largest factors in making a successful moulding. A moulder now expects to mould a simple shape, such as a bowl, at the rate of 40 to 60 lifts per hour—a rate which leaves little time for breathing. The temperature range can be varied within wide limits according to the rate of output required from the press and to the size and shape of the moulding. If one batch of moulding powder differs from another either in moulding properties or shade it is promptly returned to the manufacturer and both white and delicate translucent colours are expected to mould side by side with a black or brown phenol powder and produce spotless mouldings. In addition to this, the powder must pellet readily and the pellets must be absolutely clean. As these powders are made from a synthetic resin which is naturally sticky and adhesive, and as every speck of dirt has the unfortunate habit of rising to the surface of the moulding it will probably be generally agreed that there is no exaggeration in describing these requirements as stringent.

The simplest method of manufacture of a mouldable aminoplastic moulding powder is to condense together urea and thiourea in formaldehyde, in the proportion of not more than 50 per cent. thiourea to urea and with as little formaldehyde as is found practicable. By this process of condensation a syrup is formed containing some 50 per cent. to 60 per cent. of resin, which is sufficiently stable to be kept for some days or even, under suitable temperature conditions, for a few weeks. Wood pulp or cotton linters may be soaked in this resin and masticated in any suitable vessel, thereby producing material which, after drying and grinding, makes a moulding powder which can be moulded under suitable conditions.

There are now two types of aminoplastic moulding powder on the market, the one being a product of urea and thiourea, and the other a straight urea powder. The former has the advantage of greater water resistance, particularly resistance to cold water, for the average absorption of an article moulded from this type of powder is equivalent to less than one-fifth of 1 per cent. increase in weight after 24 hours immersion in cold water. This mixed resin powder also gives a better finish and can be moulded sufficiently rapidly for most practical purposes. The straight urea product can be given rapidity of cure according to the amount of accelerator which is used, but, if too much accelerator is added, the powder will commence to cure immediately it touches the hot mould, even if it has not started to precure before it ever reaches the mould.

All aminoplastic moulding powders suffer from the fact that they corrode ordinary steel moulds so that special steels have to be selected from which to make moulds for these powders, or, alternatively, the moulds must be chrome-plated. Ordinary steels have many advantages in that they are easy to work, soft enough to hob and yet can be readily hardened so that they do not change their shape under the strenuous conditions of moulding practice and it is not easy to find a substitute which has all these useful characteristics and does not corrode or stain when used to mould aminoplastic powders. The new process of impregnating moulds with nickel and other metals so as to produce the equivalent of stainless steel in a mould already made from ordinary mild steel is also being tried out, but no results are yet available.

Physical Society

Annual Exhibition of Instruments and Apparatus

THE 25th annual exhibition of scientfiic instruments and apparatus, arranged by the Physical Society, will be held January 1-3, 1935, at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, London, S.W.7. The leading manufacturers of scientific instruments will be exhibiting their latest products in the trade section. The research and experimental section will contain contributions from most of the important research laboratories in Great Britain, and there will be a special subsection devoted to experiments of educational interest. In addition, the work submitted for the craftsmanship competition by apprentices and learners will be on view. A discourse on "The Architecture of Molecules" will be delivered on January 1 at 8 p.m., by Mr. B. Wheeler Robinson, M.A., Ph.D.

Members of institutions and scientific societies may obtain tickets of admission from their secretaries; tickets may also be obtained direct from the Exhibition Secretary, 1 Lowther Gardens, Exhibition Road, S.W.7.

Institute of Brewing

Midland Section: The Biochemist in the Cider Factory

MANUFACTURING processes in cider making were described by Mr. V. L. S. Charley in a paper read before the Midland Section of the Institute of Brewing on November 22. He said it is essential to mill the apples at their "peak" period of ripeness; this is usually taken to coincide with the disappearance of starch, and, although regular iodine tests are not always used in a routine fashion, they do afford an excellent means of determining the best period to mill the fruit. Apart from this, it is possible to estimate the ripeness by merely pressing the fruit with the finger, when a very slight

softness in the surface indicates that maturity has been reached.

As the fruit are not picked but shaken, the adhering leaves and earth are removed by thorough washing with water by a variety of methods. The washing also serves to remove wild yeasts on the surface of the apples, the true cider yeasts being embedded in the skin. The fruit is then crushed in a grater mill and the pulp received in cloths separated by wooden racks. The juice is pressed out by hydraulic mills developing a pressure of 200 tons, and is run through a Staybrite screen to remove the larger particles of tissue. The juice is pumped to the fermentation vats where fermentation usually commences after a few hours.

Apple juice affords a satisfactory medium for yeast development. The sugar, nitrogen and mineral materials are generally sufficient for the yeasts to produce a dry cider. A medium rate of fermentation is necessary for a high-grade smooth-flavoured cider, and there are several ways of dealing with the situation. Antiseptics may be added during the fermentation (usually immediately after the cider has fermented 10-12 points, and has been racked from the deposit). The maximum allowable dose is 200 p.p.m. but it is usual to add only 100 p.p.m. at this period, retaining the rest for addition after filtration. A method has been developed in France in which the fresh juice is collected in a shallow vessel which exposes a large surface of juice to the air. Under these aerobic conditions, the yeasts propagate at a fast rate, but their fermentative capacity is repressed. The yeasts assimilate nitrogen and when a heavy crop of yeasts is formed the juice is racked to a vat for fermentation; the juice now contains only depleted resources of nitrogen and the yeast action is correspondingly retarded.

Provided that no attempt is made to interfere with the normal rate of fermentation, it is found that most juices ferment to a gravity of 1.025 in from a fortnight to six weeks. Filtering of ciders is usually completed by mid-January, although cases have frequently occurred where slow, steady fermentation continues into March. Two methods of fermentation are open to the practician; in one, the cider ferments to dryness and is sweetened with syrup immediately before filtration and bottling; in the other, sugar may be added to low gravity juices (below 1.045) and fermentation stopped at a gravity of about 1.030 for sweet ciders, 1.020 for medium sweet, and 1.015 or below for dry ciders. In any case, it is always an advantage to retain some natural sugar in a certain bulk of cider, and this is effected at the required gravity by the use of the pulp filter or centrifuge.

The filtered cider, whether still sweet or completely dry, must be stored for several months for the complex reactions which produce maturity to take place. Undoubtedly, wooden vessels are preferable to other types of containers, but recent innovations in storage vessels make use of glass linings and concrete vats covered with bituminous materials, which are air-tight and do not appreciably retard maturing. Cider reaches its most complete maturity about 12 months after the juice is expressed, longer periods tend to impart an "old" flavour which is not generally appreciated. Large vats of cider are usually stored with a light top pressure of CO_2 to prevent access of air.

The Seitz E.K. filter was introduced to the cider industry as a result of a cider-makers' tour to Germany about 6 years ago. In that short period it has been used with abundant success, and has justified what were thought to be the rather extravagant claims made for it by the manufacturers. In view of the corrosive action of cider on some metals, it is important at all stages of the process to prevent access of cider to any metal surface which is it known to be affected by the fruit acids. Practically the only metals suitable for use, and which are resistant to cider, are Staybrite, stainless steel, austenitic cast iron, and chrome nickel steel. For filter purposes, heavily-tinned copper is largely used, whilst silver is useful for intricate valves, etc., where sensitiveness has to be combined with resistance.

THE Bengal Salt Co., Ltd., recently registered, is to start a model factory on the Midnapore sea coast. It is understood that the salt will be manufactured by the method followed in Burma. Two other companies are already manufacturing salt on a small scale in Bengal, and are understood to have passed out of the experimental stage.

Harmless Tar Spraying

Farmer's Claim for Damages Fails

JUDGMENT in a tar-spraying case, which occupied four days at Leicester, was given last week by Judge J. W. McCarthy, who sat as Referee, the case having been remitted from the High Court. John Thompson, of Glebe Farm, Thurslaston, sued Blaby Rural District Council (the delegated authority) and Leicestershire County Council for £631 15s. damages for the loss of a number of cattle alleged to have been killed by drinking water polluted by the washings of tar acids from road sprayings near the plaintiff's farm.

The case was of importance to farmers (being the first case of the kind), road authorities and tar distillers, and many expert witnesses were called. Plaintiff was supported by the National Farmers' Union.

In his written judgment the Referee states: (1) There was no neglect by the defendants or either of them in and about the tar spraying. The work was performed with due skill and care. (2) The plaintiff's cattle did not die as a result of the tar poisoning or of any washings from the road. (3) The defendants did not employ any tar which contained poisonous or deleterious ingredients injurious to cattle.

The Referee directed that judgment be entered for the defendants, with costs.

Atomic Transformation

Lord Rutherford on the "New Chemistry"

LORD RUTHERFORD of Nelson delivered the Ludwig Mond Lecture in the University of Manchester on December 10. He described the "new chemistry" that was being evolved. While the old chemistry dealt with the combinations of atoms forming new compounds, the "new chemistry" dealt with the changing of one atom into another. The chief method employed was the bombardment of the atom by fast projectiles, such as protons, though recently the radiations from X-rays and γ-rays had been used.

The first proof of the artificial transformation of an atom was given in 1919, when it was found that the bombardment of the gas nitrogen by fast α-particles gave rise to the liberation of a number of fast protons which could only come from a disintegration of the nitrogen nucleus. During the last few years, another type of transformation had been brought to light in which a new and strange type of particle called the neutron was expelled. Still another striking type of transformation could be produced by α-particles resulting in the artificial production of new radioactive bodies. The residual nucleus in the transformations previously considered, the lecturer continued, was a stable nucleus non-radioactive. A radioactive nucleus was an unstable type which broke up with the emission of fast particles, ultimately forming another stable nucleus. The production of an artificial radioactive body was first noted by M. and Mme. Curie-Joliot, by bombarding α-particles.

Lord Rutherford concluded by saying that much work, often of a difficult technical character, would be required to prove the exact nature of many of the transformations which had been observed, but a promising beginning had been made. Future work might disclose many surprises, for new and unsuspected particles might come to light. In any case, they were entering a no-man's land with the ultimate hope to throw light on the way atoms were built up from simpler particles.

IN view of the large growth of the Indian sugar industry, large quantities of molasses are now available; last year the quantity produced amounted to 500,000 tons. It is estimated that this year it will amount to 650,000 tons, which the United Kingdom and a British company has already undertaken to purchase with a view to turn them into manure. The Calcutta Port authorities as well as the railways have consented to give special rates for the exports of molasses, which will prove a great boon to the sugar industry, utilising, as it does, a hitherto wasted by-product.

New Technical Books

PERFUMES, COSMETICS AND SOAPS. By William A. Poucher, Ph.C. Fourth Edition, Vol. II. pp. 599. Chapman and Hall, Ltd. 30s. net.

This book is a "best seller" among technical books, for the total issue prior to this new edition reached 8,000 copies. In the present volume the author has made use of the most recent knowledge appertaining to synthetic aromatic chemicals and their practical application in the perfumery industry. The section dealing with the more common fragrant flowers has been enlarged. The chapter dealing with fancy perfumes now includes a review of Continental practice with typical examples. A new chapter has been added dealing with fruit flavours, the preparation of the natural juices, and also a very complete account of artificial products utilising all modern synthetics. Soaps have received the author's careful attention, and the problem of cracking is discussed. The principal soap perfumes now include a complete list of perfume components from which the experimenter will be able to make a wide choice for various shades of odour. That part of the work covering cosmetics has been completely revised and amended in accordance with present-day requirements. Such important aspects as hair tonics, deodorants, skin varnishes and paraffin and radium packs, have been adequately dealt with. The volume will continue to be the most up-to-date and comprehensive treatise available, and should merit the international support already accorded previous editions.

QUALITATIVE CHEMICAL ANALYSIS. By Roy K. McAlpine, Ph.D., and Byron A. Soule, Sc.D. Based upon the text by A. B. Prescott and O. C. Johnson. pp. 696. Chapman and Hall, Ltd. 21s. net.

Analytical chemistry as studied at colleges and universities is no longer a course aimed at the development of originality in the student. It is now intended to acquaint him with methods, resources and limitations of chemical analysis. On that basis, the emphasis is shifting increasingly to a consideration of the theoretical basis of the conditions which are necessary to obtain satisfactory results. To serve this end the original text covered a wide range of experimental fact, and the material was arranged in such a way as to make it unusually accessible for reference. The present book attempts to retain the excellent features of the original text, and at the same time to expand or modify certain parts of it in such a way as to make it more useful as a text to accompany the present courses in qualitative analysis. In rewriting the procedures for laboratory work, it has been recognised that less time is available to-day than formerly for practice in analysis. Therefore the student will depend less on the results of his own varied experimentation than on the discussions in class and the notes which accompany the directions. For this reason it has been desirable to set up well-defined boundaries for the laboratory work, including the range of material covered, the concentrations studied and the general accuracy expected. Detailed directions are given for the analysis of solutions and of dry unknowns covering 23 metals (including ammonium ion) and 11 acid radicles other than the negative ions of the metals.

"GAS"—THE STORY OF THE SPECIAL BRIGADE. By Major-General C. H. Foulkes. pp. 362. Blackwood. 30s. net.

Major-General Foulkes's object in writing this book was to place on record the history of the Special Brigade, the secret unit which Sir John (later Lord) French raised in June, 1915, to carry out gas operations against the Germans in retaliation for their introduction of this horror of modern war. The book is unique in that it is the only complete account written in any language of the poison gas campaign as it was conducted by the German and Allied armies. The author raised, trained and commanded the Special Brigade during its existence and conducted the whole of its operations, and his book is an extraordinary story of humour and courage, of fighting against time as well as the enemy and of secrets loyally kept not only by members of the Special Brigade but by workers in universities, laboratories, factories and engineering shops. It provides a history of how the German gas menace was met, first defensively and then offensively; of how, apart from the meteorological advantage, the British technique advanced until it was far ahead of the German, not only in defence (and there was no comparison between the British and the German mask), but in offence, as General Schwarte admitted in "Der Grosse Krieg," where he said that the German lead was lost on the Allied introduction of phosgene shells in 1916 and projectors in 1917. Looking back it would be easy to blame the British and allied staffs for having no defence prepared when those first German gas attacks were sprung upon them. After the violation of Belgian neutrality they should have visualised other possible violations of pledges by the enemy. But both the British and French staffs had refused to believe the Germans would do such a thing, despite the reports of their own intelligence services. There were weeks of hesitation by the Cabinet before the only possible British policy, that of the most energetic reprisal, was sanctioned. But once sanctioned, Sir William Robertson (then Sir John French's chief of staff) lost no time, and he chose the right man when he sent for Major Foulkes. General Foulkes had great courage, energy, and enterprise. Only by such qualities could British mastery in gas warfare have been won: by unremitting toil and teamwork and by the unhesitating acceptance of responsibility without worrying overmuch about formal orders. The handicap was tremendous, for very different was our case from that of Germany. In the allied countries in April, 1915, no factories suitable for large-scale manufacture of poison gas existed; all had to be created, all apparatus had to be designed as fast as possible, with little chance for preliminary testing; the thing was fluid, the possibilities unknown.

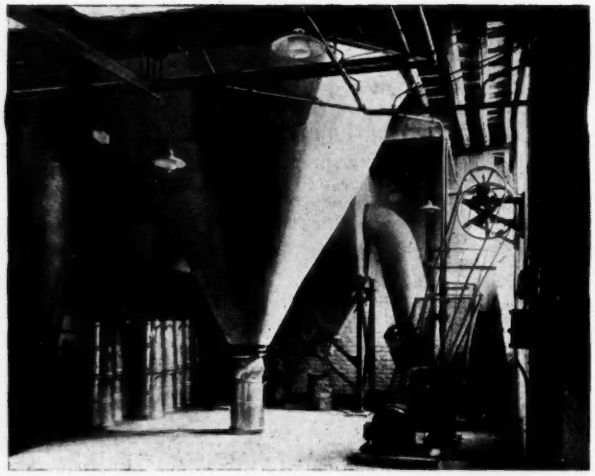
ALLEN'S COMMERCIAL ORGANIC ANALYSIS. Fifth Edition, revised. Edited by C. Ainsworth Mitchell, D.Sc., F.I.C. Vol. X, pp. 817, together with a General Index to Vols. I-X. J. and A. Churchill. 32s. net.

The publication of this volume completes the fifth edition of "Allen's Commercial Organic Analysis." Three sections are devoted to proteins—haemoglobin and its derivatives, albuminoids or scleroproteins, and structural proteins—having been held over from Vol. IX. The section on structional proteins includes animal fibres, the determination of weighting in silk, artificial silks, and the examination of furs. The examination of foodstuffs for vitamins is the subject of an interesting section contributed by Dr. J. C. Drummond and Dr. Katharine H. Coward. It is pointed out that the problem of the examination of foodstuffs for vitamins has now become one of major practical importance. In many respects the methods at present in use are unsatisfactory, but much progress is being made and reliable and generally approved techniques may soon be available. The hormones are dealt with by Mr. K. Culhane and Dr. S. W. F. Underhill. Pectic substances receive the attention of Dr. H. W. Buston.

COLLOID CHEMISTRY. By Arthur W. Thomas. pp. 512. McGraw-Hill Book Co. 24s. net.

Most books on colloid chemistry are based upon a physical viewpoint, treating the colloidally dispersed particle as a suspended, insoluble unit providing an interface to which non-colloidal substances may be adsorbed in an empirical manner quite devoid of any relationships with the phenomena of classical chemistry. In this book, however, an attempt has been made to treat colloidal dispersions from the viewpoint of crystalloidal chemistry, but the book has been written for those who are already familiar with inorganic, organic and physical chemistry, and the fundamental techniques of colloid chemistry are critically discussed with references to the literature for those who desire further details. The author has endeavoured to assemble interesting facts, even where explanation is lacking, with the hope that workers in applied fields as well as pure science may find the book useful. The range of subject matter is very wide and includes chapters on clouds and smokes, Brownian movement, liquid dispersed systems, dialysis and ultra-filtration, the nature of micelles, preparation of colloidal solutions, electrokimetics, surface phenomena, sorption, proteins, carbohydrate colloids, soap solutions, foams, emulsions, mutual reactions and gels and jellies.

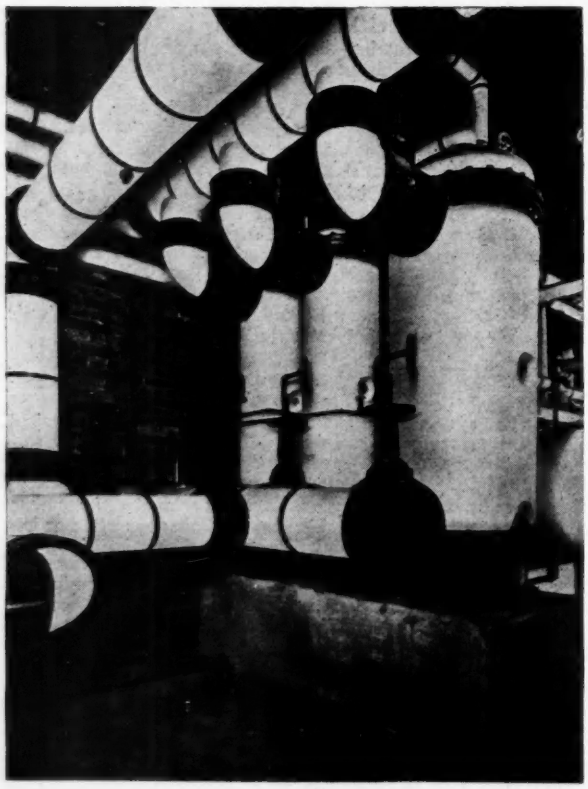
Works Equipment News



Drying Plant heat insulated with 85 per cent. Magnesia Coverings supplied by the Chemical and Insulating Co., Ltd.

Heat Insulation of Steam Pipes

CHEMICAL works, with extensive steam pipe circuits, often partly exposed to the atmosphere, are establishments in which the use of cheap and shoddy coverings constitutes a particularly bad investment. High-class boiler and pipe covering pays for itself almost in a few months because of the difference in heat insulation efficiency, and will also last for many years without disintegration due to constant contact with the hot metal. In a large proportion of cases chemical works, and other industrial establishments, can save as much as 5-10 per cent. in the coal bill by adopting scientific methods with regard to boiler and pipe coverings, quite apart from elimination of troubles due to abnormal condensation of water in the pipe circuits, and dangers from water hammer. One of the highest grade insulating products, suitable for temperatures up to 650° F., is a mixture of 85 per cent. chemically pure magnesium carbonate and 15 per cent. long-fibre asbestos, as supplied by the Chemical and Insulating Co., Ltd. The asbestos is used to give more strength and binding properties to the magnesium carbonate.



Insulation of Calorifiers and Pipework at the new Chemistry Buildings, Leeds University, with 85 per cent. Magnesia Sectional and Plastic Coverings supplied by the Chemical and Insulating Co., Ltd.

A very wide range of these "85 per cent. magnesia" sectional coverings are available, supplied in moulded form which can be fitted easily and quickly on to the steam pipes, whether hot or cold, without the use of skilled labour. This is a considerable improvement as compared with using magnesia, or any other composition, in the plastic form, necessitating also the use of the steam to dry the material on the pipes. Such magnesia sections are made in all sizes for pipes of ½ in. to 8 in. bore, and in thicknesses of 1, 1½ and 2 in. for use according to the steam pressure, with any desired outer covering such as canvas, asbestos paper, asbestos cloth, or waterproof cloth, with or without metal bands. Another advantage is that moulded sections of this type are not affected by the vibration of steam pipes used in boiling. For pipe diameters of over 8 in. diameter, and other surfaces such as boilers and turbines, moulded blocks and slabs are available, while "85 per cent. magnesia" is also supplied as a powder for use in the plastic condition if desired. It should be emphasised, however, that the efficient insulation of large and irregular surfaces, as distinct from ordinary steam pipes for which the moulded sections can be used, requires considerable technical knowledge, and in these cases the makers are always prepared to undertake the application of insulation by their own staff.

Bakelite Resin Varnishes

WIDESPREAD demand by paint and varnish manufacturers for more durable and quicker drying finishes has, in recent years, resulted in the substitution of synthetic resins for the natural resins previously employed. For this industry, "Bakelite" synthetic resins have many advantages over natural resins; for example, a more consistent resin can be ensured and lower temperatures may be employed in the manufacture of the finishes. These factors make for ease of manufacture and reliability in the resulting product.

Finishes incorporating synthetic resins are highly resistant to heat and moisture; they dry rapidly and are more durable and resistant to ordinary atmospheric erosion than those based on natural resins. They will withstand sunlight, sea water and chemical fumes, and their resistance to alkaline washing solutions is particularly good. Such a combination of desirable properties was unobtainable prior to the introduction of these special "Bakelite" resins.

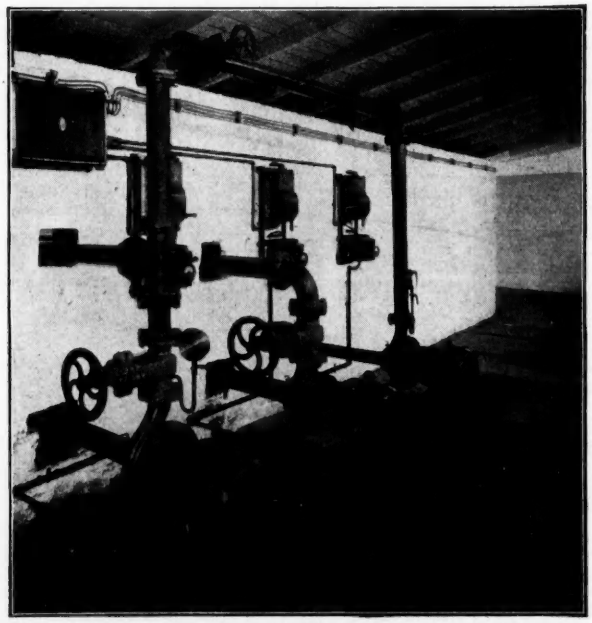
An outstanding feature of these new resins is the remarkable improvement that may result in a cheap finish by the incorporation of a small quantity of synthetic resin. Comparative tests have proved that even ordinary finishes can be greatly improved by the addition of a small percentage of "Bakelite" resin. For example, when 25 per cent. of the total resin content is "Bakelite" resin and the rest material such as ester gum acting as a diluent, a good quality varnish may be obtained at a low price. Because of the rapid drying qualities of varnishes made from "Bakelite" resins, and

their resistance to moisture, rain has very little effect on newly applied finishes.

The applications of varnishes based on "Bakelite" resins are very diverse in character. In addition to their use for normal industrial and marine purposes, their resistance to alkalies makes them particularly suitable for the protection of plant in the chemical and textile industries. They are extensively employed for the interiors of oil and water tanks.

Pumping Installations

A NEW booklet issued by Rhodes Brydon and Youatt, Ltd., illustrates several forms in which the "Patent Mopump" is manufactured, and may thus suggest to prospective users a type suitable for their particular requirements. The principle of the "Patent Mopump," now so well known, is one of "unit construction," thus doing away with baseplate and coupling. By this unit method of assembly, permanent, accurate alignment of pump and motor is ensured and there is no fear of distortion when erecting the Mopump on site. Each outfit illustrated represents a "Mopump" or Mopump product which has actually been produced for real service. Occasional departures from the unit construction are still at times called for to meet special cases, *e.g.*, for dealing with cold brine and for self-priming outfits; but wherever applicable the main principle with its obvious advantages is employed.



Three 3 in. Mopumps installed in a large Chemical Factory in the Midlands, with concrete foundations for three further pumps of the same size and type.

Mopumps are suitable for circulating brine or water in refrigerating plants, and hot water in central heating systems; delivering water to cooling, air washing, and laundering machines; boosting low-pressure supplies from water mains or other low-pressure sources; forcing water for car washing and chemical manure spraying; pumping oil, suds, chemicals, process liquors, and petrol; filling storage tanks; transferring and mixing chemicals and acids; draining cellars, sumps, process and beer vats; and for feeding low-pressure boilers.

IMPORTS into the United States of crude botanical insecticides, described in entries as derris or tuba root, totalled 575,785 lb. ($52,287) for 1933 and 425,799 lb. ($66,581) for the first 9 months of 1934. All the 1933 receipts originated in British Malaya with the exception of 337 lb. ($40) from the Philippines. In the first 7 months of 1934 receipts totalled 392,848 lb. and originated as follows: British Malaya, 370,518 lb.; British India, 15,033; and United Kingdom, 7,297 lb.

Sulphur in the Atmosphere

Work of the Pollution Research Committee

REPRESENTATIVES of local authorities and other organisations co-operating with the Department of Scientific and Industrial Research in the investigation of atmospheric pollution met last week at the half-yearly conference at the offices of the Department. The gathering included representatives from London, Manchester, Glasgow, Liverpool, Southampton, Leicester, Newcastle, Hull, Scarborough, Halifax, Lancaster, Leamington and Wolverhampton. The conference, over which Councillor W. Brownhill-Smith, of Glasgow, presided, received a report from Dr. G. M. B. Dobson, F.R.S., on the progress of the researches carried out under the Atmospheric Pollution Research Committee. Dr. Dobson stated that the new method developed at the Building Research Station for estimating sulphur in the atmosphere was now being used at 27 stations. It was hoped that it would be adopted still more widely by local authorities, as it gave, with little expense, information of great value concerning one of the most destructive of atmospheric impurities. He also referred to trials which were being made of a photo-electric method for recording daylight. If successful, this method will provide a virtually automatic means for measuring the amount of the sun's ultra-violet light cut off by smoke haze.

Mr. Beaumont, of Halifax, suggested that there was much more that local authorities could do to provide information about the effects of atmospheric pollution. He instanced that in Halifax, side by side with the deposit gauges recording the highest and lowest deposits, apparatus was employed in order to give information with regard to the sunlight received at those points. A large amount of useful information had been gained in that way, showing that as compared with the less polluted station the other lost about 25 per cent. of sunlight during the year, the percentage being greater in winter.

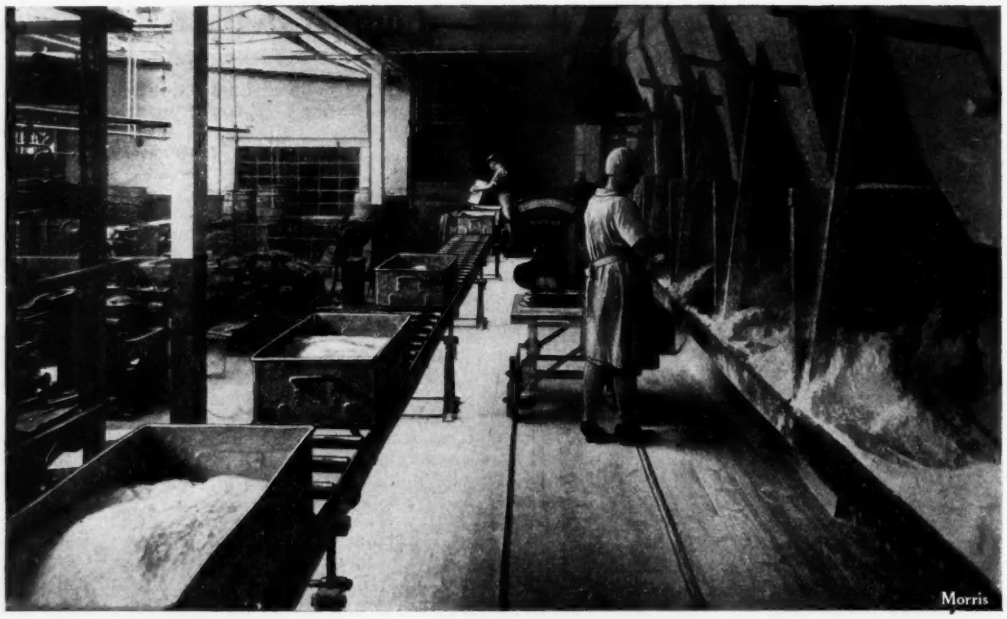
Aluminium Plant Repairs

Advantages of Electric Arc Welding

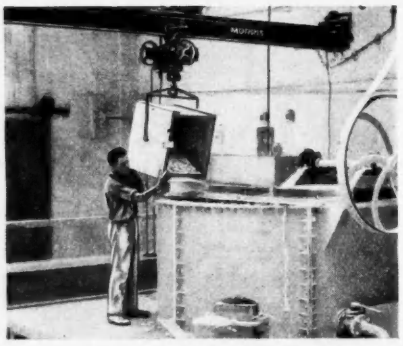
UNTIL recently, the only method employed for welding aluminium was that of the oxy-acetylene blow-pipe. Oxygen, however, unites readily with aluminium at welding temperatures and the application of any flame causes the rapid formation of oxide which is one of the fundamental difficulties of welding this metal and its alloys. This oxide is a poor conductor of heat, and the operator must either break through it by a process called "puddling" or dissolve the oxide by the use of a special flux. The electric arc, however, contains no oxygen other than that which may be drawn from the air, and it will be clear that if aluminium is welded electrically the formation of oxide with its attendant disabilities can be greatly reduced.

After experimental work entending over a period of several years, Barimar, Ltd., have been able to utilise the electric arc for the welding of aluminium and can now undertake these repairs under a "money-back" guarantee. Apart from the question of oxide, another important advantage is the localisation of heat. Although the electric arc is considered to have the higher temperature, the heat of the oxy-acetylene flame is diffused over a wider area, and as aluminium is a rapid conductor of heat it is difficult to weld any part of a casting of this material without other portions of the work being affected. The hall mark of a skilful oxy-acetylene welder is his ability to judge and control the effects of heat to a nicety; failure in this respect leads to distortion and subsequent need for rectification. By the aid of the electrical method the chances of distortion are virtually eliminated, and as machining is reduced to a minimum, substantial savings in cost are effected, and quick delivery ensured.

There may be cases in which the old oxy-acetylene method will still be used, but these are likely to be few, for remarkable results are being obtained with the electric arc method. Difficult work, such as broken crankcase supports which have been smashed off the main casting, and main bearing housings which have parted company with the rest of the crankcase, are typical instances of the type of work which is now being handled at the Barimar workshops. The former class of repair indicates the strength of this new method of welding, and the latter, the perfect accuracy that is achieved.

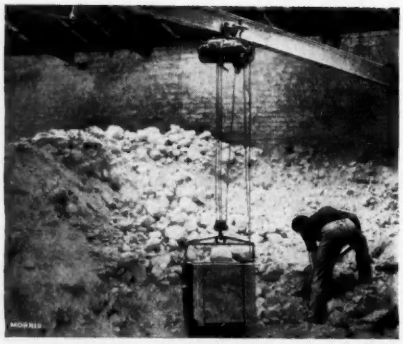


Above: The removal of material from a series of storage bins, and the ultimate transport in batches, is simplified by the use of Morris Equipment.



Left; This Morris Hoist is installed at a works where china clay is fed intermittently to a battery of mixers.

Above: Rapid transport for barrels is provided by this Morris Conveyor, whilst a Morris Runway assists in handling the barrels when discharging the contents through a chute in the floor.



Right: Moving material in bulk by means of the Morris Hoists is a very simple matter.

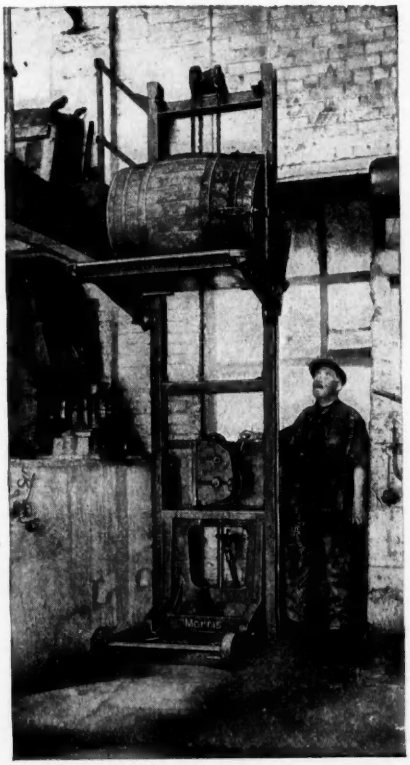
Modern Lifting and Conveying Equipment

(Reproduced by courtesy of Herbert Morris Ltd., Loughborough.)

Above : These barrels of zinc oxide are neatly placed in the works store by the aid of a Morris Crane, the initial cost of which is very small.

(Reproduced by Courtesy of Herbert Morris Ltd., Loughborough)

Right : Even a boy can run a Morris Lift of this type and find it easy to operate. The racks on the trolley are holding soap tablets.



Above : The ingredients for "Walpamur" paint products are raised to the top of the mixing vessels by means of a Morris Stocker.

Above : This strong Morris Conveyor is used for raising heavy steel drums and can be installed at a loading dock.

News from the Allied Industries

Low Temperature Carbonisation

EXTENSIONS TO THE WORLD'S LARGEST LOW-TEMPERATURE PLANT for producing smokeless fuel, petrol and fuel oil from coal are to be officially opened by Mr. Ernest Brown, Secretary for Mines, at Askern, near Doncaster, on December 19. The seventh and eighth batteries of retorts now being completed will constitute an addition to the works of 72 retorts, making a total of 288 retorts for the whole plant, which is a world's record. The extensions will increase the Askern output by one-third, thus enabling the company better to meet the increasing demand for coalite, fuel oil and coal petrol.

Foodstuffs

IN A CIRCULAR TO SHAREHOLDERS the directors of Crosse and Blackwell, Ltd., state that they are of opinion that a further period should elapse before putting forward their capital reconstruction proposals, in order to permit of certain important re-grouping of factories. One of the company's London factories has to be vacated under a housing scheme, and another has become unprofitable owing to continued depression in the export trade. The necessary re-groupings will take some time to complete and will call for considerable expenditure out of the company's resources before the resulting benefits can be secured.

Dyeing and Cleaning

A CIRCULAR HAS BEEN ISSUED to the shareholders of Associated Dyers and Cleaners, Ltd., notifying them of the retirement of two directors and the appointment of two new members of the board, one of whom, Mr. George E. Leavey, has been appointed chairman of the reconstituted directorate. Mr. Frank Eastman will act as deputy chairman and will remain chairman of J. Pullar and Sons, the company's subsidiary. On the recommendation of the committee or shareholders, it has been decided to form a local board at the Acton works. It is expected that by remitting to the local board the many problems that constantly arise in connection with the Acton works, the main board will have more time at their disposal to deal with the questions of policy which still confront the company.

Coal and Iron

EXTENSIVE INTERESTS in the coal and iron markets are represented in a £17,000,000 merger scheme, details of which were announced on December 11. The main companies concerned are Powell Duffryn Steam Coal Co., Ltd., and Welsh Associated Collieries, Ltd., but in addition to the colliery properties and other undertakings of these two concerns the scheme involves the entire preferred and ordinary share capital of fifteen subsidiaries and the entire ordinary share capital of Stephenson, Clarke and Associated Companies, Ltd. The scheme provides for the formation of a new operating company which will possess more than seventy-five collieries, with a potential productive capacity exceeding 20,000,000 tons of coal a year and available reserves estimated at more than 1,700,000,000 tons.

Sugar

SIR LEONARD LYLE, chairman of Tate and Lyle, Ltd., addressed shareholders at the 32nd annual general meeting of the company, held in London, on December 6. He said the future of the British beet sugar industry will have to be decided soon, and a committee—under the chairmanship of Mr. Wilfred Greene, K.C.—is at present examining the whole question. It is clear that the British beet sugar industry must continue to receive some form of Government assistance if it is to continue, but the marketing proposals which have been under discussion have been put forward with the sole object of helping the beet sugar industry, and they were not put forward by the refiners in their own interests. The proportion of the sugar consumption of the country supplied by Tate and Lyle, Ltd. (including those companies in which they have a controlling interest), amounted last year only to 62 per cent.

Continental Chemical Notes

Italy

LOW-TEMPERATURE LIGNITE DISTILLATION and refinement of the crude products is to be undertaken at Palmas Suergiu, in Sardinia, by the Compagnie Chimico-Mineraria del Sulcis. The low-temperature distilling unit is reported to be already in operation.

France

FURTHER ACTIVITY IN HYDROGENATION is reported in "Chemische Industrie," preliminary work having commenced on new plants in the Mazingarbe and Bully districts.

ABNORMALLY DRY WEATHER has seriously influenced this year's French lavender flower harvest and an oil output of less than 60 tons is anticipated.

METALLIC MAGNESIUM is produced by electrolysis of natural magnesium chloride extracted at Péchiney, on the Mediterranean coast, by the Péchiney and Usine Magnesium concerns who are now contemplating extensions which will give a potential annual output of over 1,000 tons.

FOLLOWING AN EXPERIMENTAL STUDY of the factors governing the decomposition of calcium bicarbonate in aqueous solution, Robert Stumper ("Chimie et Industrie," November, 1934) concludes that the rate of decomposition is dependent not only upon physical conditions (pressure, temperature, etc.) and the initial concentrations of bicarbonate and free carbon dioxide, but also to some extent upon foreign substances dissolved or suspended in the water. In the light of the author's experimental data the chemistry of natural and industrial waters appears to be more complicated than was previously supposed.

Poland

THE MANUFACTURE OF SODIUM BISULPHATE in 65 per cent. concentration is to be carried on at a new plant erected by the "Slaskie Kopalnie," at Cynkownie. This expansion in the production of sodium bisulphate, following on the recent activities in the same field of two other concerns, is bound to reduce bisulphate imports (amounting to 900 tons last year) to vanishing point.

Germany

THE MERITS AND DEMERITS of modern organic heat transfer liquids in place of steam, examples of which are diphenyl, diphenyl oxide, tricresyl phosphate, as well as mixtures of the diphenyl oxide-diphenyl and diphenyl oxide-naphthalene type are discussed by Dr. G. Spangler in "Chemische Industrie," November 28, in the light of new experimental data. Reference is also made to the recent introduction in the United States of a heat transfer medium which can be heated to 340 to 400° C. without volatilising.

THE ELIMINATION OF SULPHUR from pyridine bases prior to hydrogenation to avoid poisoning of the nickel catalyst can be conveniently effected by pre-treatment with metallic compounds of the type of sodamide and sodium cyanamide. Thus, on heating coal tar pyridine at 100° C. with 5 per cent. of sodium cyanamide for a sufficient period, hydrogenation to piperidine proceeds smoothly in the presence of the usual nickel catalyst at a temperature of 200° C. and a hydrogen pressure exceeding 100 atmospheres. Homologues of pyridine are also amenable to the treatment (German Pat. 605,228).

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications Open to Public Inspection

DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 27, 1933. 1235/34.

ALUMINIUM ALLOYS.—P. Briske and V. Prohl (trading as Briske and Prohl), and A. Luschenowsky. June 3, 1933. 3542/34.

POTASSIUM NITRATE from sodium nitrate, production.—Kali-Forschungs-Anstalt Ges. May 31, 1933. 7401/34.

GLUCOSIDES, preparation.—H. T. Böhme A.-G. June 3, 1933. 12975/34.

RUBBER-LIKE PRODUCTS from olefine halides and polysulphides of the alkali or alkaline earth metals, manufacture and production.—I. G. Farbenindustrie. May 31, 1933. 14529/34.

COMPOUNDS OF THE PYRIDINE SERIES, manufacture.—Chemische Fabrik von Heyden A.-G. May 27, 1933. 15528/34.

CENTRIFUGAL SEPARATION of mixtures.—Sharples Specialty Co. May 27, 1933. 15543/34.

PURIFYING GASES, methods.—British Thomson-Houston Co., Ltd. May 29, 1933. 15885/34.

SULPHONIC ACIDS, production.—Farb-und Gerbstoff-Werke C. Flesch, Jr. May 29, 1933. 15791/34.

SUBSTITUTED BARBITURIC ACIDS, manufacture.—Chemische Fabrik von Heyden A.-G. June 3, 1933. 16009/34.

BASIC COPPER CHLORIDES, manufacture.—I. G. Farbenindustrie. May 31, 1933. 16267/34.

CHEMICAL PRODUCTS and process for preparing same.—E. I. du Pont de Nemours and Co. June 2, 1933. 16377/34.

SUBSTITUTED ALDOLS, manufacture.—I. G. Farbenindustrie. June 2, 1933. 16383/34.

DYESTUFFS OF THE TRIARYLMETHANE SERIES, manufacture.—I. G. Farbenindustrie. June 3, 1933. 16427/34.

UNSYMMETRICAL PENTACARBOCYANINE DYESTUFFS and of intermediate products therefor, manufacture.—I. G. Farbenindustrie. June 3, 1933. 16592/34.

SENSITISING SILVER-HALIDE gelatine emulsions.—I. G. Farbenindustrie. June 3, 1933. 16594/34.

SUBSTITUTED AROMATIC AMINO-COMPOUNDS, manufacture.—I. G. Farbenindustrie. June 3, 1933. 16596/34.

DYESTUFFS OF THE ANTHRAQUINONE SERIES, manufacture.—E. I. du Pont de Nemours and Co. June 3, 1933. 16609/34.

TREATING HYDROCARBONS to form coke, method.—Brassert-Tidewater Development Corporation. June 24, 1932. 34053/34.

Specifications Accepted with Dates of Application

ALPHA-AMINOANTHRAQUINONES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Nov. 20, 1933. 420,359.

PLASTICISERS, manufacture and application.—H. Dreyfus. Feb. 17, 1933. 420,181.

PLASTICISED COMPOSITIONS and articles made therefrom.—H. Dreyfus. Feb. 17, 1933. 420,221.

LIQUID HYDROCARBONS, asphalt oils and oils in general, or mixtures of the same with methyl and ethyl alcohol, or mixtures of such alcohols, heat-treatment.— E. Livraghi. Sept. 16, 1932. 420,370.

DYESTUFFS for animal fibres, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 17, 1933. 420,149.

PETROLEUM PRODUCTS, stabilisation.—J. W. Orelup. May 26, 1932. 420,371.

HYDROCARBONS OF LOW BOILING-POINT by the heat-treatment of mixtures of oils, production.—J. Y. Johnson (I. G. Farbenindustrie). May 29, 1933. 420,235.

DYESTUFFS OF THE TRIARYLMETHANE SERIES, process for the manufacture.—I. G. Farbenindustrie. May 30, 1932. (Addition to 387,956.) 420,307.

PIGMENTS, manufacture.—L. Paindavoine. Aug. 19, 1932. 420,308.

Applications for Patents

(November 29 to December 5 inclusive.)

HIGH-PRESSURE STEAM PLANT.—G. Bauer. (Germany, Dec. 14, '33.) 34692.

COKING LIQUID HYDROCARBONS, etc.—H. A. Brassert and H. A. Brassert and Co., Ltd. 34608.

TREATMENT of suspension of coal, etc., in liquid hydrocarbons. H. A. Brassert and Co., Ltd. 34609, 34610.

PLASTICISATION of cellulose esters, etc.—British Celanese, Ltd. April 13, '33. (United States, April 13, '32.) 34813.

CELLULOSE ESTERS, manufacture.—British Celanese, Ltd. (United States, Dec. 5, '33.) 34937.

COPPER POWDER, manufacture.—British Copper Refiners, Ltd., T. Hewitt and L. G. Stewart. 34843.

PRODUCING NITRIC OXIDES from the air.—British Thomson-Houston Co., Ltd. (Germany, Dec. 2, '33.) 34713.

LIQUID COATING COMPOSITIONS.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 21, '33.) 34296.

ACETYL BENZOYL PEROXIDE, process for making.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 22, '33.) 34297.

ACETOACETANILIDE, process for preparing.—Carbide and Carbon Chemicals Corporation. (United States, Dec. 2, '33.) 34393.

COATING ABRASIVE GRAINS.—Carborundum Co. (United States, Dec. 16, '33.) 34989.

SULPHUR DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 34743.

CONDENSATION PRODUCTS, manufacture.—A. Carpmael (I. G. Farbenindustrie). 34846.

COLOUR LAKES, manufacture.—A. Carpmael (I. G. Farbenindustrie). 34992.

ALUMINIUM OBJECTS, electrolytic oxidation.—H. Dittmayer. 34977.

RUBBER, vulcanisation.—E. I. du Pont de Nemours and Co. (United States, Jan. 11.) 34509.

SILICIC ACID GELS, production.—Grasselli Chemical Co. (United States, Dec. 1, '33.) 34508.

WHITE LEAD, electrolytic production.—H. G. Hills. 34805.

LIQUIDS FROM COAL, etc., production.—T. G. Hunter and A. W. Nash. 34554.

3-AMINOQUINOLINE DERIVATIVES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 34450.

CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 2, '33.) 34699.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, Dec. 1, '33.) 34700, 34701.

N-SUBSTITUTION PRODUCTS of alpha-aminoanthraquinone, etc., manufacture.—I. G. Farbenindustrie. 34942.

PLASTIC COMPOSITIONS.—Imperial Chemical Industries, Ltd., 34731.

DELUSTRED ARTIFICIAL SILKS.—Imperial Chemical Industries, Ltd., and H. D. Mudford. 34850.

COPPER-CONTAINING MONOAZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and F. L. Rose. 34851.

DYEING LEATHER, process.—Imperial Chemical Industries, Ltd., G. S. J. White and J. Burchill. 34852.

SOLID CHLORINATED RUBBER, production.—Imperial Chemical Industries, Ltd., and T. N. Montgomery. 34853.

DESTRUCTIVE HYDROGENATION of carbonaceous materials.—Imperial Chemical Industries, Ltd., and M. A. Matthews. 34873.

LIQUID HYDROCARBONS, production.—International Hydrogenation Patents Co., Ltd. (Germany, Jan. 18.) 34785.

ALKYL HALIDES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 34941.

RENDERING WATER FREE FROM GASES, etc.—E. Klausner and K. Glässner. 34453.

LIQUID-OXYGEN EXPLOSIVES.—Lightfoot Refrigeration Co., Ltd., and A. E. Lance. 34468.

CONCENTRATED PHOSPHORIC ACID, manufacture.—R. Moritz. (France, Dec. 5, '33.) 35000.

METALS, production.—Oesterreichisch Amerikanische Magnesit. (Austria, Dec. 12, '33.) 34352.

RECOVERING COMPACT METALLIC MAGNESIUM from magnesium dust, etc.—Oesterreichisch Amerikanische Magnesit. (Austria, May 4.) 34353.

RESISTING DYESTUFFS.—C. S. Parker, Bleachers' Association, Ltd., A. E. Stubbs, C. L. Wall and F. Farrington. 34638.

LOW-BOILING HYDROCARBONS, etc., production.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). 34784.

ACRYLIC ACID ESTERS, polymerisation.—O. Röhm. (Germany, Dec. 2, '33.) 34693.

ALCOHOLS, etc., into fuels for internal-combustion engines, transforming mixtures.—Soc. Anon Carburanti Italia and E. Livraghi. (Italy, Dec. 4, '33.) 34877.

BENZOLS, etc., treatment.—Soc. Anon. d'Ougree Marihaye. (Belgium, Nov. 10.) 34425.

TETRA ALKYL LEAD, producing.—W. W. Triggs (Du Pont de Nemours and Co.). 34597.

PRODUCTS IN SOLUTION by means of solvents, extraction.—Usines de Melle. (France, Dec. 7, '33.) 34827.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no changes to report in the general prices of heavy chemicals, wood distillation products, pharmaceutical and photographic chemicals, perfumery chemicals and intermediates, but there have been some slight adjustments in the prices of some of the coal tar products. Unless otherwise stated the prices quoted below are for fair quantities net and naked at sellers' works.

LONDON.—Prices still remain very steady and the good general demand is also maintained. Prices of coal tar products remain firm. There is a good demand for benzols and naphthas. Pitch is quoted at about 47s. 6d. per ton, f.o.b East Coast port.

MANCHESTER.—Little or no change has occurred during the past week in the general position of the chemical market here. With odd exceptions, the price situation is steady and the expectation is for a continuation of the firmness that has characterised the majority of the bread-and-butter lines during the past twelve months. This trend is reflected in the fact that, apart from one or two items, contract prices have been left unchanged over the first partof next year. With regard to forward commitments, in some quarters satisfactory reports have been forthcoming during the past few days as to the aggregate volume of business booked recently, and the outlook is for at least the maintenance of the progress made, even if further progress is not made during the coming months. In the meantime, consumers are taking steady deliveries of a fairly wide range of products although a quiet spell is looked for in this respect from about next week until early in the new year.

SCOTLAND.—Little or no buying of any consequence is being done in the Scottish chemical market, owing to the near approach of the end of the financial year for most of the companies operating in Scotland.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—10½d. per lb. less 5%. MANCHESTER: 10½d. to 10¾d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE. SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 4d. to 1s. 6d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 5d. to 2s. 9d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3⅞d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—8¼d. to 8¾d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 10s.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¼d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NIRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10¼d.

POTASSIUM PRUSSIATE.—LONDON: 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5s. to 5¾d. ex store. MANCHESTER: 5s. to 5½d.

SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.

SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER. £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 8¾d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 1s. 11d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 4d. to 4½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3¾d. f.o.r. North; 4d. London. MANCHESTER: 3¾d. to 4¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160% 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—50s. per ton. LONDON: 47s. 6d. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. 9d. to 2s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p CRESOL 34-5° C.—2s. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3ss. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Dec., £7 0s. 6d.; Jan., 1935, £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—Dec., £7; Jan., 1935, £7 1s. 3d.; Feb., £7 2s. 6d.; Mar., £7 3s. 9d.; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.

NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid to farmer's nearest station for material basis 15.5% nitrogen.

CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton, for delivery up to June, 1935, in 6-ton lots carriage paid to farmer's nearest station.

Latest Oil Prices

LONDON, December 12.—LINSEED OIL was steady. Spot, £19 15s. (small quantities 30s. extra); Dec., £18 5s.; Jan.-April, £18 12s. 6d.; May-Aug., £19 5s.; Sept.-Dec., £19 12s. 6d., naked. SOYA BEAN OIL was steady. Oriental (bulk), Dec.-Jan. shipment, £16 15s. per ton. RAPE OIL was quiet. Crude extracted, £28; technical refined, £29 10s., naked, ex wharf. COTTON OIL was firm. Egyptian crude, £20; refined common edible, £23 10s.; and deodorised, £25, naked, ex mill (small lots 30s. extra). TURPENTINE was steady. American, spot, 44s. 6d. per cwt.

HULL.—LINSEED OIL, spot, quoted £19 7s. 6d. per ton; Dec., £18 15s.; Jan.-April, £19; May-Aug., £19 5s.; Sept.-Dec., £19 12s. 6d., naked. COTTON OIL, Egyptian, crude, spot, £20 5s.; edible, refined, spot, £22 10s.; technical spot, £22 10s.; deodorised, £24 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £15 10s., naked. GROUNDNUT OIL, extracted, spot, £25; deodorised, £29. RAPE OIL, extracted, spot, £27; refined, £28 10s. SOYA OIL, extracted, spot, £18 10s.; deodorised, £21 10s. per ton. CASTOR OIL, pharmaceutical, 37s.; first, 32s.; second, 29s. per cwt. TURPENTINE, American, spot, 46s. 6d. per cwt.

IN view of the large growth of the Indian sugar industry, large quantities of molasses are now available; last year the quantity produced amounted to 500,000 tons. It is estimated that this year it will amount to 650,000 tons, which the United Kingdom and a British company has already undertaken to purchase with a view to turn them into manure. The Calcutta Port authorities as well as the railways have consented to give special rates for the exports of molasses, which will prove a great boon to the sugar industry, utilising, as it does, a hitherto waster by-product.

From Week to Week

THE LIBRARY of the Chemical Society will be closed for the Christmas holidays from 1 p.m. on Saturday, December 22, until 10 a.m. on Friday, December 28.

GREAT BRITAIN may enter the European steel cartel as a result of the discussions now being held in London on the amendment of the 33⅓ per cent. duty on iron and steel.

MANCHESTER INDUSTRY will be benefited by a gift of £20,000 given by Mr. Bruce Mac Macpherson, son of Mr. Evan Macpherson, to start the "Evan Macpherson Fund," one of the purposes of which is to defray the expenses of scientific research.

IMPERIAL CHEMICAL INDUSTRIES, LTD., has given 30 acres of the upper valley of Dovedale to the National Trust. The land, which is the first given by an industrial firm, is next to that which was presented recently by Mr. Robert McDougall.

SULFUROPHOSPHATE, LTD., Moorgate Hall, Moorgate, E.C., have increased their nominal capital by the addition of £7,000 beyond the registered capital of £15,000. The additional capital is divided into 7,000 7 per cent. cumulative preference shares of £1 each.

THE IMPROVEMENT OF BUSINESS in the German iron and stel industry is shown both by a bonus that Krupps of Essen are giving their workers and the 4 per cent. increase in the dividend of the Upper Silesian works at Borsig, raising the rate of dividend from 3 to 7 per cent.

THE PAINT INDUSTRY CLUB will hold its ladies' night at the Trocadero Restaurant, London, on Friday December 21, at 6.45 p.m. Tickets, price 10s. 6d. each (including gratuities but not wines), can be obtained from the Hon. Secretary, 8 Broadway, Ludgate Hill, E.C.4.

PAPERS PUBLISHED FROM THE NATIONAL PHYSICAL LABORATORY during November included one on "The determination of the specific heat of gases at high temperatures by the sound velocity method. I.—Carbon Monoxide," by G. G. Sherratt, and E. Griffiths, D.Sc., F.Inst.P., F.R.S. ("Proceedings of the Royal Society, A.," *147*, 292.)

THE CO-ORDINATION OF NOBELS EXPLOSIVES PRODUCTION at Ardeer, Ayrshire, is not expected to take place until late in 1935, or early in 1936. The Linlithgow factory will probably continue in production for another year, after which it will be offered for sale. Most of the married employees of the Regent factory will be transferred to Ardeer, where houses are being built for them by the Ayrshire County Council.

THE CENTRAL COMMITTEE of the Cotton Spinners and Manufacturers' Association held a meeting at Manchester, on December 4, when it was explained that the minimum annual expenditure of the British Cotton Industry Research Association at Shirley Institute, Didsbury, exceeded last year's income by £30,000. An appeal had raised promises of £18,000, while the Government had promised a maximum grant of £20,000 a year, conditional on the annual income for cotton research reaching £37,500.

THE JAPANESE GOVERNMENT is understood to be forwarding forwarding protests to the Chinese Central Government and the Hunan Provincial Government regarding the marketing of antimony from that province. Hunan is alleged to have granted monopoly rights for the marketing and export of antimony to a British firm. The province is said to produce 80 per cent. of the world production of antimony, and Japan buys 90 per cent. of her antimony from this source.

THE PROCESS OF SPRAYING PROTECTIVE METALLIC COATINGS and the wide range of subjects to which the process is applied were described in a paper by Mr. W. E. Ballard before the Manchester Association of Engineers at the Engineers' Club, Manchester, on December 7. Metal spraying, said Mr. Ballard, was a method by which, with a universal tool, any metal or alloy which could be drawn into a wire and would melt in an oxy-acetylene blowpipe flame could be used as a coating. Within his own experience he had known it in industries so far apart as the manufacture of artificial teeth and diamond drills, and on articles so widely divergent as gun-cotton and gasholders.

SIR HARRY MCGOWAN, chairman of Imperial Chemical Industries, Ltd., stated at Glasgow on December 7, that the production of petrol from coal at the company's plant at Billingham, should begin early next year. Speaking at the annual dinner of the Scottish Furniture Trades Benevolent Association, he said that many hopes attached to the new process of hydrogenation. Construction at Billingham was well up to expectation. They were convinced from their past researches, which had been both extensive and expensive, that this plant would achieve success, but they would readily understand that it would have to be run for some time before there could be any question of duplicating that plant, either at other centres in England or in Scotland. Any hopes of the early erection of a plant in Scotland should not be entertained.

THE TREASURY has issued an order for the allowance as from December 12, of drawback of Customs duties in respect of olive oil used in the manufacture of canned fish.

A PETITION for the winding-up of the New Zealand Sulphur Co., Ltd., presented by John Goodenday, of 1 Portland Place, W.1, will be heard at the Law Courts, London, on December 17.

THE HATHERN STATION BRICK AND TERRA COTTA CO., LTD., have changed their name to Hathernware, Ltd. No alteration is made in the formation of the company or its activities. Telephone numbers, telegraphic address, etc., remain as before.

ALARCAL, LTD., electro-metallurgists, electro-chemical engineers, etc., 409 Caxton House, Tothill Street, S.W.1, have increased their nominal capital by the addition of £16,000 in £1 shares beyond the registered capital of £4,000.

AT THE TUNSTEAD WORKS of I.C.I. on December 11, David Turner fell from a steel girder and was instantly killed. His employers, the Northwich firm of Joseph Parkes, are erecting lime-kilns at the works.

ARTHUR SAMUEL GIBBS, Ian G. Drysdale, John Sarler, and other chief officials of various salt companies are reported to have been arrested and committed for trial on charges of forming a trust to raise prices artificially.

NOTICE WAS GIVEN in the "London Gazette" of December 7 of the voluntary winding-up of the Central Treviscoe China Clay Co., Ltd., and of the appointment of Mr. J. W. Shaffery of Bourner, Bullock and Co., St. Austell, Cornwall, as liquidator.

THE DIRECTORS OF INTERNATIONAL BITUMEN EMULSIONS consider that the company's capital exceeds the value of its assets by more than £47,148. The matter will be dealt with at the annual meeting, and a plan for a reduction of capital will be submitted at a meeting to be called for the purpose.

A NARROW ESCAPE was experienced on December 7 by Frank Brumby, an engine-driver at the Appleby Iron Works, Scunthorpe, when his engine and two ladles, each containing twelve tons of molten slag, which were being pushed by the engines, fell down an 80-ft. slag bank. Brumby continued to work to the end of the shift.

THE NATIONAL SMOKE ABATEMENT SOCIETY has just issued, in booklet form, its fifth annual report for 1934-1935, containing, in addition to a review of the past year's activities, full particulars of the constitution and membership of the Society, lists of subscriptions and donations, and information concerning admission to membership.

DR. JOHN READ, professor of chemistry at St. Andrews University, stressed the importance of petroleum as a source of energy in a lecture given on December 7, at Glasgow, to the Andersonian Chemical Society. He stated that while the test-tube contained the essence of science, one should look beyond the laboratory and regard the results of research against a background of the Empire.

TEETA, an employee of African Explosives and Industries, (a subsidiary of Imperial Chemicals, Ltd.) and a native preacher, retired recently from the Modderfontein factory, where he had a record of forty years' unbroken service. He took with him some new clothes, travelling rug, a suitcase, pipe and tobacco and £16 in cash, tokens of regard from his associates at the factory, where his industry and his sermons on Sundays made him universally respected.

THE INAUGURAL MEETING of the Staff Management Association, formed recently under the auspices of the Institute of Labour Management, was held at Terminal House, Victoria, S.W.1, the headquarters of the Association, on December 5. The chair was taken by Mr. J. H. Fullwood, president of the Institute of Labour Management, who said that in view of the growing recognition of the importance of staff management to every kind of organisation, business or governmental, in this country, the Association had been formed to provide a focus for information and opinions. The committee had arranged an attractive programme for the session including papers from members of the personnel management of Unilever, Ltd., and Rowntree and Co., Ltd., and from the Inland Revenue, and, furthermore, informal dinners and discussions had also been organised.

A PLEA FOR BETTER ROADS through greater co-operation between quarry owners and manufacturers of road surfacing material was made by Mr. Henry B. Milner, at a meeting of members of the Devon and Cornwall District of the Institute of Quarrying, held at the Continental Hotel, Plymouth, on December 6. The call for the quarrying industry more actively to bring its materials and manufacturing processes into line with the efficiency now unquestionably attained by bitumen and tar refiners was, he maintained, an urgent one, and in the problems with which they were faced in the future—in connection with highway construction he felt that the industry had a wonderful opportunity to exert itself to give a lead where, hitherto, it had lagged behind.

THE TOTAL IMPORTS OF CHEMICALS INTO INDIA during the six months from April to September last, amounted in value to Rs.144 lakhs, as against Rs.126 lakhs in the corresponding period of the previous year. Imports of acids rose from 15,000 to 17,000 cwts. and there was also a general increase in sodium compounds. There was a slight decline in the imports of china clay. There was a large increase in the imports of dyes from coal tar which amounted to 10,000,000 lbs. as against 5,000,000 in the previous year, the value rising from Rs.89 lakhs to Rs.141 lakhs. The imports of chemical manures rose from 17,000 tons to 31,000 tons. The imports of paints and colours fell from 195,000 cwts. to 162,000 cwts. The imports of paper rose from about 1 million lbs. to about 1.2 million lbs.

Company News

British Oxygen Co.—The payment of dividend on the 6½ per cent. preference stock is announced.

Reeves and Sons.—The payment is to be made on January 19 of a dividend of 1½ per cent., less tax, on the ordinary shares.

British Silk Dyeing.—The accounts to September 30 show trading loss £4,842; total loss £31,925, including £17,650 to depreciation; the debit brought in has been increased to £62,798.

Zinc Manufacturing Co.—For the year to June 30 last, the report shows a loss of £70,938, after writing off £849 from shares in subsidiaries. The total debit now stands at £265,028.

International Nickel of Canada.—The payment of a quarterly dividend at the rate of 7 per cent. per annum on preferred stock, payable on February 1.

Boots Pure Drug Co.—The directors have declared a quarterly interim dividend of 6 per cent. on the ordinary shares, the same as for the corresponding period of last year.

Broken Hill South.—The report for the year to June 30, 1934, shows net profit £220,214; mining section, £139,543; investment section, £80,671. Dividends took £200,000 and £33,000 has been appropriated for plant and development, leaving £221,560.

Eastman Kodak Co.—In addition to the regular dividend of $1 which was declared on November 8, the company has declared an extra common dividend of 75 cents per share, payable on January 2, 1935.

Doncaster Coalite.—Sales of Doncaster Coalite, a subsidiary of Low Temperature Carbonisation, for the year to September 30, it is stated, have improved by 25 per cent., and trading profit rose from £28,587 for the previous nine months, to £46,507.

British Tyre and Rubber Co.—The annual report shows a profit of £126,715, of which £15,000 has been allocated to contingencies reserve and £25,000 to general reserve. A final dividend is paid on the ordinary shares of 5 per cent., making 8 per cent. for the year, leaving £32,562 to be carried forward

Bleachers' Association.—The directors state that they are unable to recommend an interim dividend on the 5½ per cent. cumulative preference stock for the year ending March 31, 1935. The dividend on this stock is paid to June 30, 1933. There is £2,487,500 of the stock outstanding. The last ordinary share dividend was 6¾ per cent. for 1930.

Powell Duffryn Coal Co.—The directors announce, in addition to the fixed payment on the preference and preferred ordinary, an interim dividend of 1½ per cent. (actual), less income-tax, on the ordinary stock. The ordinary stock received 1½ per cent. a year ago, and this was followed by a final dividend of 5 per cent., making 6½ per cent. for the fifteen months to March 31 last.

Bradford Dyers' Association.—The directors have decided to defer payment of the dividend on the 5 per cent. cumulative preference stock for the six months ended December 31. The dividend on this stock, has now not been paid for the years 1933 and 1934. No dividend has been paid on the £2,258,794 of ordinary stock since 4⅛ per cent. for 1930.

Milton Proprietary Co.—For the nine months to September 30, 1934, the net profit is £36,341, which is a rateable increase of 23 per cent. over the net profit of £49,139 for the previous fifteen months. The total dividend is 11¼ per cent. for the period, comparing with 18¾ per cent. for the previous period. The annual meeting will be held at Winchester House, London, on December 20, at 12 noon.

British Burmah Petroleum Co.—A trading profit of £29,527 is shown for the year to July 1, 1934, compared with £65,495 for the previous year. The total revenue, including interest, profit on sale of investments, etc., and £1,334 brought in, is £48,483. Provision for expenses, fees, depreciation, sinking fund, etc., amounting to £105,528, leaves a debit of £57,045 to be carried forward. No dividend has been paid since 1931. The annual meeting will be held at Southern House, London, on December 18, at noon.

Bussey Coal Distillation and Bussey International.—The report to June 30 shows a loss by Bussey Coal of £1,789, increasing debit brought in to £220,223; the loss by International Co. was £677, increasing debit to £13,156.

Sangers, Ltd.—The directors announce an interim dividend of 5¼d. per share, equivalent to 8¾ per cent., less tax, on the ordinary shares. Last year the interim dividend was 8½ per cent., and was followed by 11½ per cent., increasing the total dividend from 17½ per cent. to 20 per cent.

North Broken Hill.—The report of North Broken Hill for the year to June 30, 1934, shows a net profit of £273,355, against £166,565. Dividends totalled £192,500, and, after a £30,000 appropriation for new plant, a balance of £446,042 remains, subject to the dividend of 1s. 6d. per share and bonus of 1s. per share paid in September. A dividend of 1s. 6d. per share was announced in November.

British Tyre and Rubber Co.—The net profit for the year ended September 30 was £126,714, an increase of £17,549. The directors are raising the appropriation to reserves from £30,000 to £40,000 and propose to increase the final dividend on the ordinary shares from 4 per cent. to 5 per cent., making 8 per cent. for the year, against 6½ per cent. Moreover, the final dividend is payable on a capital of £800,000, whereas the dividends for 1932-33 were paid on an ordinary capital of £650,000.

India Rubber, Gutta Percha and Telegraph Works.—The net profit for the year ended September 30 was £26,053. The directors have decided to declare a dividend at the rate of 5½ per cent. on the preference share capital for the year ended September 30, payable December 17, 1934, which will absorb £13,750, to transfer to contingencies reserve account £5,000, leaving a balance to be carried forward of £7,303. For 1932-33 there was a total net loss of £48,211, which was written off under the capital reorganisation scheme.

Ilford, Ltd.—A net profit of £96,250 is reported for the year to October 31, 1934, compared with £94,611 for last year. The dividend is maintained at 6 per cent. and £20,000 is written off investments in subsidiary companies. Last year £20,000 was placed to reserve and £100,000 from reserve was written off investments in subsidiary companies. Further centralisation of business, it is stated, has been carried out and an interest has been taken in the Dufaycolor Film Process of Colour Photography, and interest in Spicer-Dufay (British), Ltd., has been acquired. The annual meeting will be held at Winchester House, London, on December 18, at 2.30 p.m.

Low Temperature Carbonisation.—The report for the year to October 31, 1934, shows that sales of "Coalite," coal petrol and oil, etc., totalled £328,190 in comparison with £274,430 for the previous year, an increase of 20 per cent. Dividends on investments amounted to £24,764, against £12,541, and there was a stock of "Coalite" and by-products of £21,902. After allowing for interest, depreciation and tax, the net profit is £37,234, against £13,456 a year ago. With £7,548 brought forward there is £44,782 available. When the dividend of 3 per cent. is provided for and sums written off issue expenses, etc., £2,790 remains to be carried forward.

Ruths International Accumulators.—The report for the year ended December 31, 1933, shows a profit, including "profit realised during the year on the sale of investments," of £1,344, which has been applied towards writing down value of patents. Scheme of reduction and reconstruction of capital not approved by Court until May 7, 1934, and not effective on December 31, 1933; it has, therefore, been necessary to carry forward the loss provided for under the scheme £288,417, less net adjustment owing to cancellation of interest due from, and royalties and patent expenses due to, subsidiary company £1,846, leaving a debit balance of £286,571. This amount will be carried forward and written off out of capital reserve account created by reduction of capital.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Canada.—A firm of wholesale dealers in painters' supplies, etc., at Montreal is prepared to undertake United Kingdom agencies for ultramarine blue, nitrate of lead, bichromate of soda, trisodium phosphate and sodium hyposulphite, on a commission basis, in the provinces of Quebec and Ontario. (Ref. No. 523.)

Uruguay.—The British Consul at Montevideo reports that the National Fuel Administration at Montevideo is calling for tenders, to be presented in Uruguay by January 8, 1935, for the supply of 28 steel tanks and accessories of various capacities for the petroleum refinery to be constructed at La Teja. (Ref. G.Y. 14576.)

Forthcoming Events

LONDON.

Dec. 18.—Annual Chemical Dinner and Dance. 7 for 7.30 p.m. Hotel Great Central, Marylebone, London.

Dec. 19.—Institution of Chemical Engineers. "Separation of Solids from Liquids (Thickening). Dr. Wm. Cullen and H. T. Durant. 6 p.m. Burlington House, Piccadilly, London.

Dec. 19.—Electrodepositors' Technical Society. Joint meeting with the Faraday Society. London.

Dec. 20.—The Chemical Society. Ordinary scientific meeting. 8 p.m. Burlington House, London.

Dec. 21.—The Paint Industries Club. Ladies' Night. 6.45 p.m. Trocadero Restaurant, London.

BIRMINGHAM.

Dec. 18.—Midland Metallurgical Societies. "Interpretation of the Equilibrium Diagram." N. P. Allen. 7 p.m. James Watt Memorial Institute, Birmingham.

Dec. 21.—Electrodepositors' Technical Society. "Barrel Plating Technique." E. J. Dobbs. 7.30 p.m. James Watt Memorial Institute, Gt. Charles Street, Birmingham.

CARDIFF.

Dec. 19.—Society of Chemical Industry (South Wales Section). "The Electron in the Service of Man." W. Somerville Vernon. 7.30 p.m. The Technical College, Cardiff.

EDINBURGH.

Dec. 18.—Society of Chemical Industry, Institute of Chemistry and Chemical Society (Edinburgh Sections). "The Manufacture of Edinburgh Town Gas." J. P. Scott. 7.30 p.m. North British Station Hotel, Princes Street, Edinburgh.

GLASGOW.

Dec. 19.—Institution of the Rubber Industry (Scottish Section). "Variability of Plantation Sheet." (2nd part). John Young and E. H. Ruch. Institution of Engineers and Shipbuilders, Elmbank Crescent, Glasgow.

HUDDERSFIELD.

Dec. 18.—Society of Dyers and Colourists (Huddersfield Section). "Colorimetry in Industry." G. S. Fawcett. Huddersfield.

HULL.

Dec. 18.—Hull Chemical and Engineering Society. Presidential address. "Machine Tools." L. H. Downs. 7.45 p.m. Municipal Technical College, Park Street, Hull.

STOKE-ON-TRENT.

Dec. 17.—Ceramic Society (Pottery Section). "Silicosis in the Pottery Industry." Dr. William R. Jones. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

New Companies Registered

British Anodising, Ltd.—Registered December 10. Nominal capital £20,000. Manufacturers, importers, exporters and brokers of and wholesale and retail dealers in all kinds of aluminium and aluminium ware. A subscriber: J. R. Beckensall, 29 Alwyne Villas, Canonbury, London, N.1.

B. and G. Manufacturing Co., Ltd.—Registered December 6. Nominal capital, £15,000. Manufacturers, sellers, refiners and transporters of and dealers in all kinds of chemicals, oils, industrial and other preparations; manufacturing and general chemists, etc. A subscriber: Henry J. Fellows, 13 Brampton Grove, Kenton, Middlesex.

Commercial Consultants, Ltd.—Registered December 10. Nominal capital £100. Analytical and consulting chemists, manufacturers of and dealers in chemicals, gases, medicines, plaster of paris, gypsum, etc. Director: Edmund Garside, Uplands, Sandy Lane, Romiley.

Pollopas Patents, Ltd., 2 and 3 Charterhouse Square, London, E.C.1.—Registered November 22. Nominal capital £60,000 in 5s. shares. To adopt an agreement with Pollopas, Ltd., to acquire the registered trade marks Nos. 452,881, 452,882, 452,883, 520,333 and 550,730, being the word "Pollopas," relating to goods in classes 1, 39 and 50, and to carry on the business of manufacturers, finishers, refiners, extractors, importers and exporters of and dealers in chemical products of all kinds, particularly synthetic or artificial resins and their constituents, glass, china, porcelain and meerschaum products, optical and photographic products, instruments and appliances, lapidary, turnery and jewellers' products, instruments and appliances, electrical products, paper, textile products, etc. Directors: Julius C. Vredenburg, Arthur E. Middleton.

Town End Chemical Works, Ltd.—Registered December 10. Nominal capital £25,000. To acquire the business of manufacturers and distributors of chemicals and dyewares and their auxiliaries and derivatives now carried on by the trustees of the late Arthur Smith at Town End, Bramley, Yorks, as "The Town End Chemical Works." Directors: Mrs. Amy A. Smith, Elmfield, Bramley, Leeds; Stanley M. H. Rimmel.

The British Tin Smelting and Refining Co., Ltd., Victoria Station House, London, S.W.1.—Registered on November 22. Capital, £50,000. Tin ore smelters and tin refiners, smelters of tin concentrates and ores, engineers, chemists, metallurgists, etc. Directors: Robert H. Brown (director of W. E. Moulsdale and Co., Ltd.), John G. Cowen.

Official Publications Received

Report of the Fuel Research Board for the Year Ended March 31, 1934. London: H.M. Stationery Office. Pp. 178. 3s.

Bulletin of the Imperial Institute. Vol. XXXII. No. 3. 1934. London: John Murray. Pp. 180. 3s. 6d.